American Machinist

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Flexibility, Accuracy, Economy

In an Engine Block Line

W. H. SWINK

Production Engineer
Lycoming Manufacturing Company

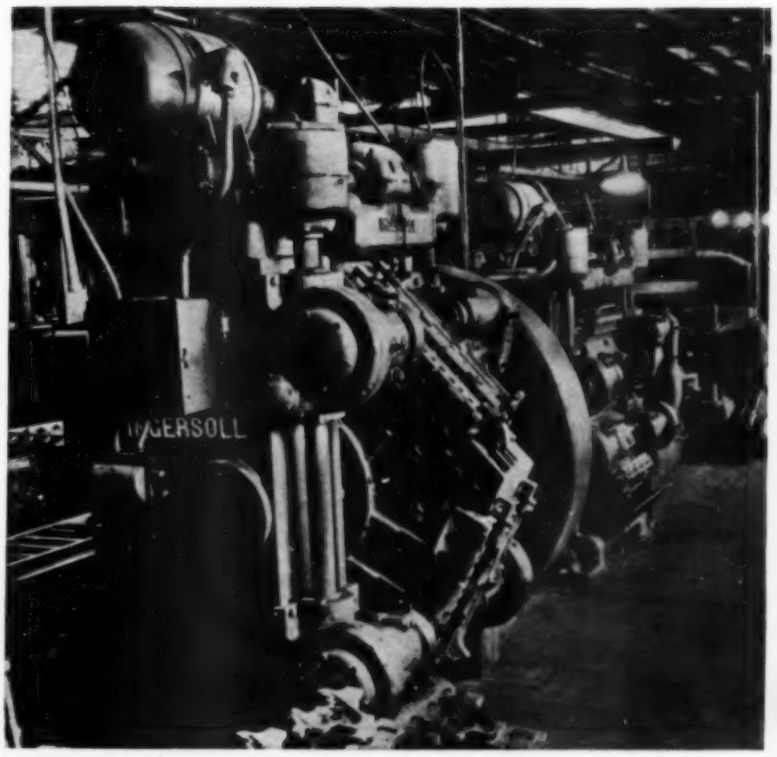
Lycoming's equipment was selected to get the most out of carbide tools

EIGHTEEN months ago the demand for Auburn cars had exceeded the capacity of the engine cylinder block line at the Lycoming plant, which builds engines for Auburn and Duesenberg cars, Stinson planes and various makes of trucks and motor boats. The first step taken by the Lycoming management to get the additional production required was to tool up with tungsten carbide and increase the speeds and feeds of the machines.

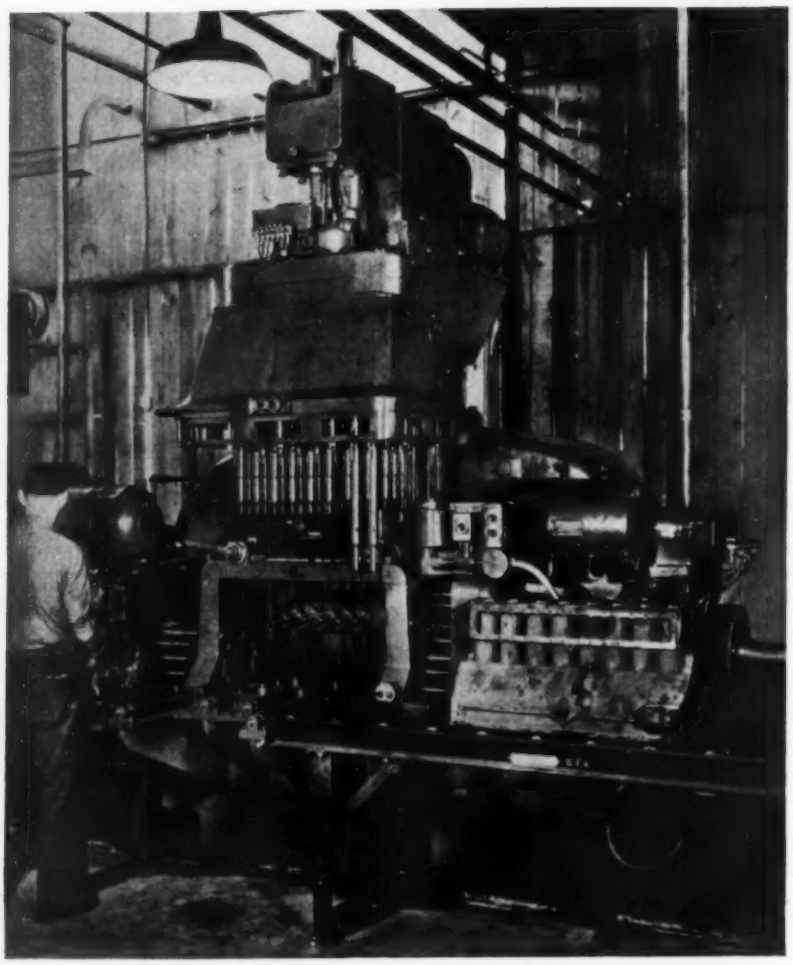
The necessary changes in fixtures and the alterations to and tightening up of machines were immediately made and the carbide tool equipment installed. The result was an increase in output from ten cylinder blocks per hour to approximately sixteen blocks per hour. The demand being still beyond the capacity of the machine line it was evident that the potentialities of carbide tooling could not be realized with the existing equipment.

When it became clear that the limit with carbide tools on present equipment had been reached, it was decided to go ahead on a replacement program on machines that would produce the required output as economically as possible and with greater accuracy, and at the same time have considerable flexibility. The experience gained in the application of carbide tools to the old machines proved to be invaluable in the selection of new machines.

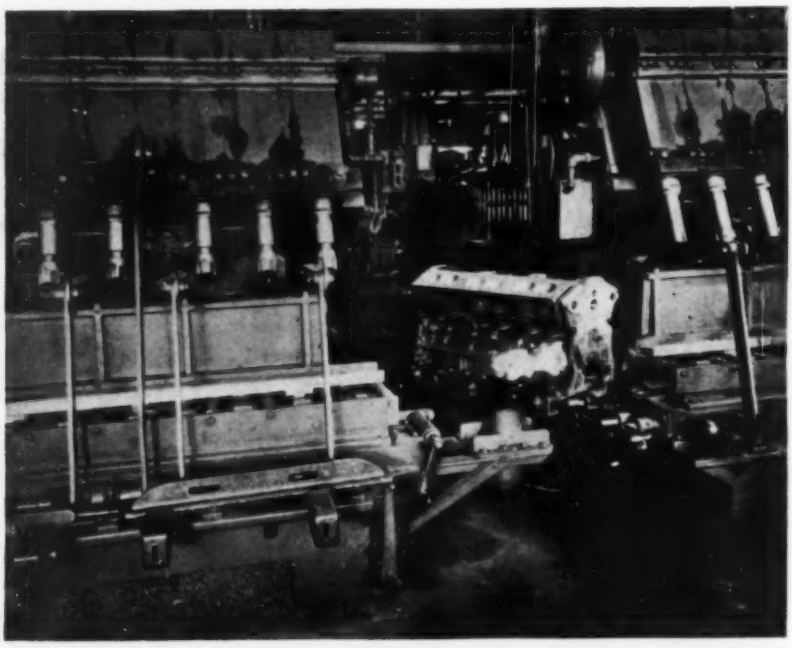
In September, 1931, the new equipment was selected and ordered and in December it was in production. Two cylinder block lines were planned, one for the 8-cylinder straight blocks and the other for the 12-cylinder V-type blocks. The primary objects sought were increased accuracy at less cost and higher production per hour. However,



Drum-type milling machines perform the first operations on blocks for straight-8 motors



Four-way multiple tapping machine in 8-cylinder line



A simple turntable fixture saves exertion in connection with the cylinder boring operations

because of the constantly changing demand of the automotive industry in the way of new engines and improvements in existing engines, flexibility of equipment was a very definite objective. The requisite has been achieved to the extent that the equipment installed will accommodate blocks 6 in. longer and 4 in. higher than those now in production, and the spacing of cylinder bores, valve openings, and other holes can be varied within reasonable limits. No fixed center drilling equipment was purchased and the milling and boring machines have the necessary range to permit these variations.

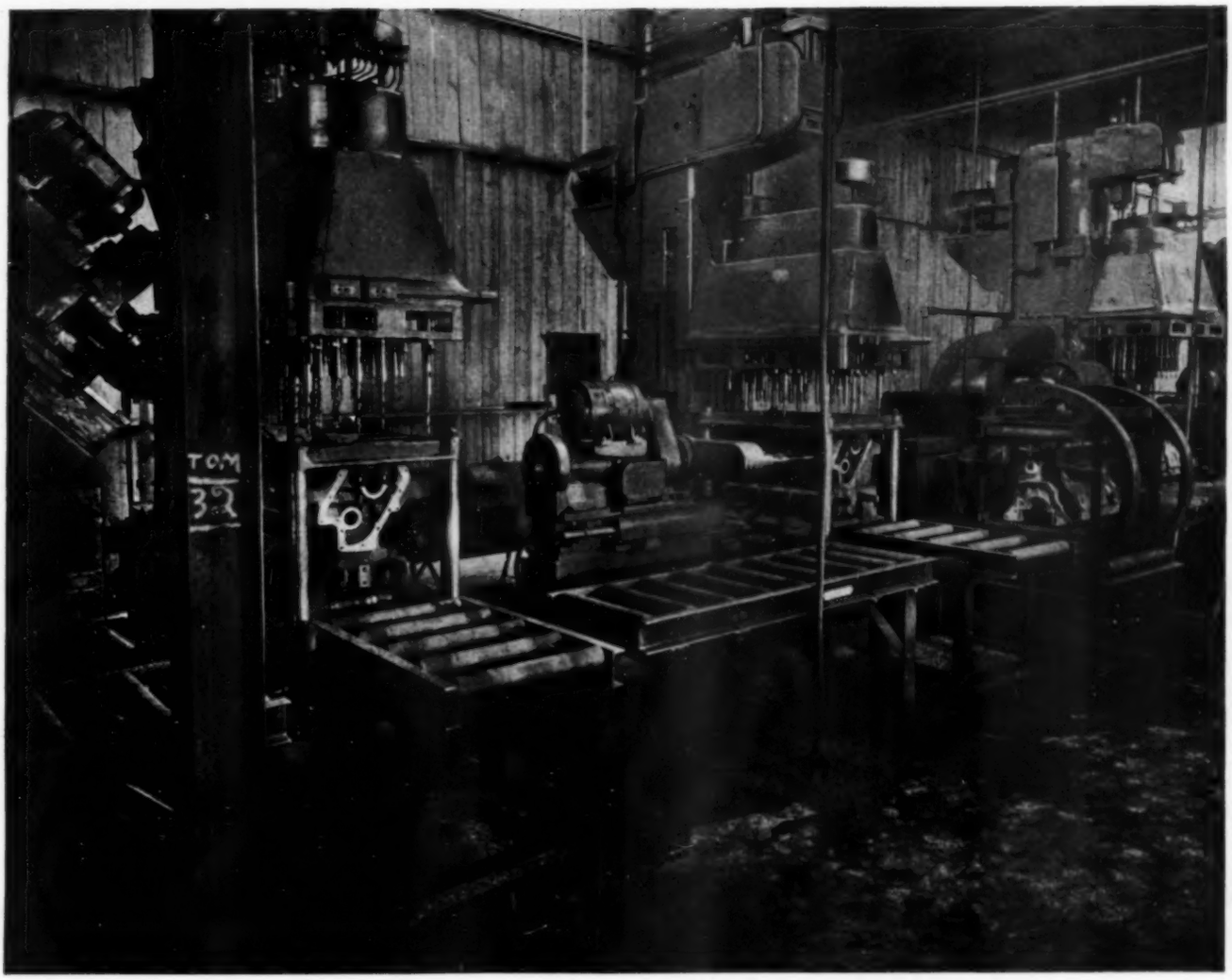
A Carbide Tipping Department

The materials to be cut include cast iron, aluminum and bronze. Carboloy tips are used on milling cutter teeth, boring and turning tools and on some of the core drills. Appreciable economies have been gained through organizing a department for tipping the carboloy tools. In addition, many bits from milling cutters are salvaged for use on smaller tools for other operations. As new bits can be obtained overnight by mail from the Philadelphia branch of the Carboloy Company, this department operates very quickly.

On the evening of the ninth day after the foundry delivered the first casting for the new line, sixteen finished engines were running under their own power. A few adjustments had been necessary but on the whole the new line functioned almost perfectly from the start.

Careful organization of the installation, plus cordial cooperation on the part of production engineers, machine tool builders and their demonstrators, produced this gratifying result. The factory men knew by what railroad every unit was to arrive and on what day. When it reached the plant, its foundation was ready and installation proceeded without delay. The big drum-type milling machines came last because their locations were nearest the door and it would have been impossible to get other machines past them after they were in place. Sample parts had been machined in the builders' plants, of course, which insured satisfactory performance of the machines.

Particular attention was given to the elimination of fatigue through proper coordination of the conveyor units, machine bed heights and turnover fixtures. Where the machine bed did not line up with the conveyor level, simple hydraulic hoists were installed to handle the blocks. With a few exceptions, where blocks must be turned by hand, turnover fixtures have been inserted in the conveyor line so that each operator receives the block in the correct position

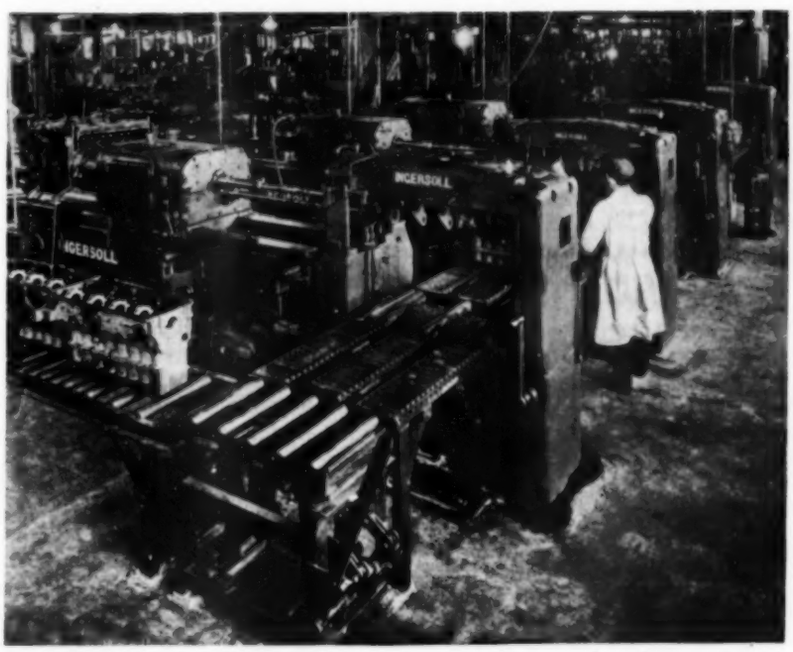


Two rotating fixtures and a turnover fixture used to facilitate getting straight-8 blocks into and out of multiple drilling machines

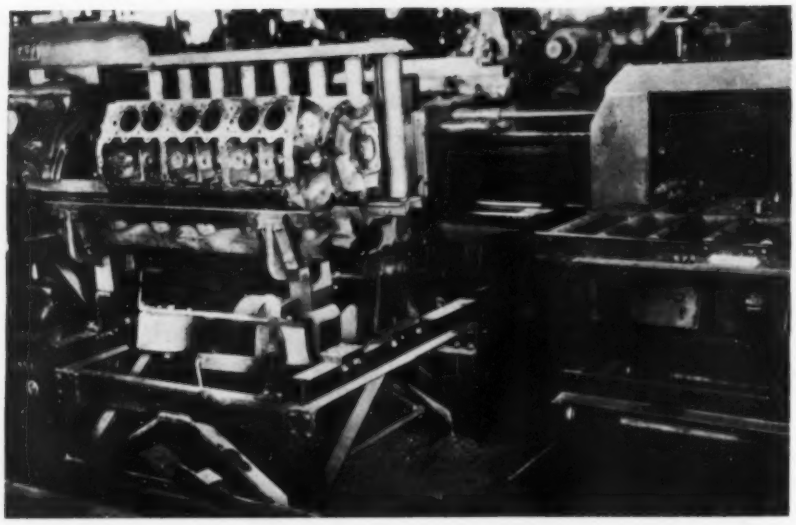
for insertion in the fixture of his machine. A power hoist is used to lift blocks onto the head end of the conveyor line, but thereafter no such device is necessary. Fixtures are equipped with quick-operating clamps, except in a few cases where screw clamps were better adapted to the operation.

Five groups of operators, under the supervision of a foreman and an assistant foreman, operate this block line on a group incentive basis. The foreman is held responsible for quality and the number of men in each group is adjusted to the production going through the line. Most of the operators have had experience on more than one machine and are therefore somewhat versatile. The assistant foreman, however, can operate any machine in the line.

Tooling has been so designed that no toolsetters or toolmakers are required. Each operator has two sets of tools for each of his machines and is capable of changing tools whenever it becomes necessary. The foreman, assistant fore-



Direction and elevation of the conveyor both change at this point



A turnover fixture rotates the V-12 block between manufacturing milling machine and boring machine

man and electrician, with the assistance of factory representatives of the manufacturers of the machines, have familiarized themselves with all common types of failures likely to occur and consequently are in a position to make all ordinary repairs to these machines. This line is considered by many machine tool builders to be one of the most efficient cylinder block lines in operation.

What have been the financial results of this investment in tools? The base cost of machining the cylinder block has been cut almost exactly in half. With the flexibility of the machines, already emphasized, their useful life is naturally extended far beyond the present design of engine. It is a certainty that this equipment will more than pay for itself.

Standardizing Automatic Screw Machine Cams

C. W. HINMAN

Shop records of cams and tools save expense

HERE is a method that has been used to index automatic screw machine cams with good results:

Make a loose-leaf book for the cams of each machine size; the pages can be the size of commercial letter sheets. Lay out the cams, one to a page, by scribing the contour and holes with a sharp pencil. Show the hundredth numbers that designate where the lobe starts and ends. Show the rises and dwells in decimals of an inch. Show the name and number of the cam and where it may be found by giving the section and shelf number in the tool vault.

This procedure saves time and money when making new sets of cams. Often a suitable cam is found in this record, or a whole set of cams, by slight changes, can be picked to suit a new set.

Some shops use a card file for their front and back cams for each machine size. Each card carries the record of one cam. The record appears as follows:

Rise 0.042 in. in 15/100. Lobe starts at 84; ends at 99.

Used on No. 0 machine. For P-2915. Section B, shelf 14. The cards are filed according to numerical rise, beginning with the smallest.

Sometimes drilling another pin hole and stamping it *A* is all that is necessary to make use of a cam. To the record is added: "Lobe starts at 54 from Hole *A*." A similar card file is used for roughing and finishing hollow mill sizes.

For special lead cams, an adjustable commercial device has recently appeared, for No. 00, 0 and 2, Brown & Sharpe automatics. The various lobes and rises desired are secured side by side on a spool, until a cam of the required number of lobes is built up. This idea is in the right direction. A few changes are necessary to use these cams, such as the substitution of a wider cam roll.

A good micrometer is cheaply made for measuring cam lobe rises. A piece of $\frac{3}{16}$ in. × 1 in. cold rolled steel, 5 in. long is used. A small block is riveted at one end, in which a micrometer barrel and spindle are mounted, coincident with the center line of the strip. At the opposite end of the strip a slot is cut 0.312 in. wide and about 2 in. long coincident but not through the end. Three hardened studs about $\frac{1}{16}$ in. high, one for each of the machine sizes, are made to fit the cam center holes. A tongue is cut straddling the diameters of the studs, 0.310 in. wide and 0.180 in. high. A $\frac{1}{4}$ × 24 threaded bolt is placed through the centers of the studs and with a wing nut and washer the tool is complete. The tongues on the studs slide in the slot but can be locked in any position by the wing nut.

A variation of this micrometer is made for bench use by using a larger tool body. These tools are oxidized, or white nickeled, and kept in a neat hinged-cover box.

Measuring Cam Lobe Rises

In operation: Set the micrometer at 0. Put the center hole of the cam over the stud. Slide the cam lobe toward the spindle, touching it lightly at its lowest point. Lock the cam with the wing nut. Back away the spindle. Revolve the cam until the high point of the lobe is in line with the spindle. Advance the spindle, touch the high point, and read.

There are a number of perishable tools for automatics that can be standardized and card records made: circular tools for marking the cutting off groove, having included angles 60 and 90 deg. with a 0.050 in. straight nose between; widths of cutting off blades, made proportional to stock diameters; cutting off tools with standard blade widths, backed with chamfering angles; straight-nose circular forming tools with chamfering angles; flat centering drills, thread rolls, swing recessing cutters, slotting bushings, and slotting arm cams.

The designer should make standard tables for each machine size, showing the various B.&S. spindle speed ratios between the forward and backward revolutions of the machines. For example:

No. 00 machine 792/420 = 1.886 . . .
No. 0 machine 445/200 = 2.225 . . .
No. 2 machine 277/120 = 2.308 . . .

These tables save time when computing threading lobes for the lead cam.

Idle Time—

What Shall We Do With It?

ADULT EDUCATION has been for some time a serious matter to many of the men and women to whom we look for leadership. But under that name the subject has sounded discouragingly academic. Since 1929, however, when adversity shortened the working period abruptly as compared with the progress made by the slower forces of mechanization, it has changed rapidly from an academic to a very practical consideration. Discussion aroused by the Black 30-hour week bill shows how practical. And now that it is painfully evident that leisure, enforced or otherwise, is going to be with most of us for some time to come, it becomes of real import what we shall do to direct it into useful channels. These three short articles give three different approaches to the subject. It is our hope that their publication will arouse constructive comment which we may print in subsequent issues.

An Employer's Answer

ALFRED RHEINSTEIN
President, Rheinstein Construction Company

THE DEPRESSION has given impetus to the adoption of the five day week and the six hour day, but in the long run mechanization alone would force a shortened schedule on industry. It is evident that existing machinery, with relatively few operators, can now turn out more economically the work which many men formerly performed, and, in addition, deliver a surplus. There is no immediate prospect of markets broadening to absorb the excess of production, and as mechanization continues to develop even more men will be put out of employment if the working time remains fixed. The condition is not static and any plan to balance machine production and human labor with human consumption must include a device to compensate for the difference in rates of progress between production and consumption.

One of our present difficulties is, I believe, in a false aim. It has become a fixed idea that men should labor a minimum of eight hours and in that period produce as much as their skill and their tools will permit. It is assumed that demands, though fickle, are insatiable and, if reasonable change is made in the type of product, there will always exist a market. The aim therefore seems to be constantly to improve and modify the product but always to increase output and thereby one's wealth. That is the so called business or practical reasoning.

In their more relaxed and fanciful moments men dream of less labor and more leisure. Through the ages philosophers have based their plans for a happier world on just that dream. Not because men would toil less but because they might do more with their leisure. With the advent of a shortened working schedule there will be a greater opportunity for an enjoyment of leisure than ever before. If, instead of the present futile attempt to procure additional productive occupation for unemployed man hours, effort were directed toward utilizing leisure for the benefit of the individual and the general good, the aim would not only be more desirable but it should be more sound and practicable.

Under any circumstance, the effect of a reduced working week cannot be truly considered independently of the influence of added leisure hours. Whether those leisure hours shall become idle hours or whether they shall be filled with constructive and recreational activities is a matter for human planning and provision. It is too much to expect that the industrial world will concern itself with leisure from the disinterested angle of human progress, but it should be keenly alive to the effect of applied leisure on the type and quantity of its output, and industry should be on guard to prevent the deterioration in man power which will set in if leisure hours become mere loafing time. It will therefore profit industry to devise plans to condition men quickly and effectively to the new order. Eventually a general, uniform method may be evolved but at the beginning there would be many experiments from different approaches. To start the ball rolling let us see what could be accomplished through one unit of a larger scheme as applied to a single branch of an industry—building construction.

Assume that the six hour day ends at 3:00 P.M. From 3:30 until 5:00 the superintendents, foremen and office men would present to those workmen who desire it information on the construction

of the particular building on which they would be working, as well as on the various branches and phases of the trades. One group might be learning to read the language of their industry from blue prints, while others more advanced might have laid before them an explanation of the general plans, the progress schedule and the scope of the work. After presenting a general idea of the common task more detailed explanations would be imparted to them. A vital element of building construction is assembling and installing the great variety of materials so that a precise timing and sequence will avoid damage and confusion and will produce a coordinated workmanlike finish. Give the mechanic in one trade an understanding of fundamentals of allied trades and he will become a better mechanic and a more intelligent workman. It is not the purpose here to schedule an exact or detailed course but merely to indicate a direction and see where it may lead.

Mechanics of Yesterday

In the days when a building was a simpler and a smaller unit than it is today a mechanic could and did make a complete installation of the things included in his trade. Today he is skilled in only a small branch of his trade and repeats limited operations without an understanding of their significance or performance. For instance, a couple of mechanics twenty-five years ago would, under the direct supervision of their employer, install a heating system in a small building without the aid of a foreman and would naturally comprehend how it functioned and why each step was taken.

In a big modern structure the heating system is a sensitive, complicated engineering plant. Few individual mechanics have anything but the haziest idea of how it works or how it is put together. One man is a good pipe cutter, another is adept at installing boilers, while still another may excel on pumps. Each does little outside of his specialty. But it is the foreman who constantly directs them and inspects and supervises their every move. What the mechanic has lost in initiative and self-sufficiency the foreman has acquired. He not only can ply his trade in all its branches but he has risen to be an organizer, an executive, a leader. But he must be an exceptional individual with the vitality and ambition to attend night school, the intelligence to apply his learning, the personality to direct his crew and the character to shoulder his responsibility. He is a splendid type but difficult to find and is developed too haphazardly. Elevate your mechanic and you will lighten the foreman's task, eliminate much error and establish a wider field from which to select your foremen.

With six hours' manual labor and one and a half hours' mental activity, the workman would return to his home less fatigued than under the present schedule and be in condition to pursue more intelligent and enjoyable things with his family and for himself. By unlimbering his mind and training him to think, you would raise his standards of living. High wages alone are not enough. And, as you raised his standards, his demands would improve and increase, and that, in turn, would improve and increase the output of other industries upon which he would draw in his leisure time. The man would be better off; industry would profit.

There are certain idealistic elements in this scheme which to put into practical use would require energy and patience. At first, many men would ridicule, and, it being voluntary, would not attend the periods of instruction. But as they observed the advancements and benefits gained by those who did attend, they would be won over to it.

There are many beneficial ramifications to the plan which are self-evident; clarification of the undertaking in the minds of the supervisors who present the subjects, a better understanding between employer and employee, etc.

The scheme applies to other industries, especially those using factories, as well as to the building industry, and even could be used advantageously in offices. The salesman, or for that matter, the executive who understood accounting could better fill his own position, and the accountant, with a grasp of administration and selling, would be a better accountant. There would be those unable to assimilate what would be offered, but such individuals will always exist and the large majority should not be sacrificed for them.

The past working schedule of labor was probably necessary to arrive at our present state of mechanization, but, having reached it, the old order has become obsolete. It is like employing a steam boiler as an efficient instrument in the construction of a hydro-electric plant. Once the plant is built and electric power developed there is no longer an economic use in that area for the steam boiler. We have built with our former engines of toil a new mechanism more efficient, more automatic and more powerful than the old. It is folly to continue the use of the old one, but men must be conditioned to operate the new and to enjoy its benefits. That process of preparation for new conditions of labor and of social life in a machine age might best be assumed by industry, but for industry to engage in such a project, the undertaking must be directly profitable to industry. The by-products of that plan may well emerge more important than the direct results. The important thing is to start immediately to conceive of much unemployment as leisure, to remove it from the field of philanthropy, and to make it pay.

II

An Engineering Department Solution

W. S. BROWN

A FEW months ago I had an opportunity to visit the engineering department of a large plant which at that time was just keeping going. The staff had been cut down to a skeleton crew but because the organization was large and complex there were still a good number of engineers and draftsmen working on a four-day basis. Having come from an engineering department which was being hard pressed to complete designs in process of development, the contrast was striking. In this department were men who, having spent many years with the firm, were the cream of their particular profession, and they were lapsing, by reason of making a few jobs go a long way, into comparatively sluggish thinking and habits of lassitude. In the second rank were others whose ambition was to grow in experience and value to the firm through accomplishment but unable to follow this plan through the very shortage of work. Further down the line were the pick of the juniors, retained by reason of the promise they showed.

If, instead of dead slow working on the few designs in hand, a situation so self-evident that it was obviously blinked at by the officials, a little speeding up had been done, an hour a day could have been released and this time put to profitable use in a definitely

planned educational program. The results of such a program could be made so profitable that the company might be tempted to continue such a scheme, in a modified form, when better times come along. In bad times the stimulating effect of the studies would do wonders to the morale of the men. If the program were properly organized most of the men who were good enough to be retained in a skeleton crew would be genuinely interested in such a "post graduate" course.

In an office like this one there is almost certain to be some fellow who was graduated with honors in some engineering subject, or perhaps some who worked their way through college by teaching. The seniors could give talks based on their accumulated experience in developing the firm's product. Concrete examples might be taken from the errors and misjudgments which almost crept in or which did actually get by. They could amplify this by drawing on a general bibliography of the subject.

For the juniors there could be a program of definite lessons in mechanical drawing and allied subjects. These might perhaps be organized in conjunction with the I.C.S. or university extension courses which so many of our young men take up with an enthusiasm that unfortunately is largely evanescent. Such cooperation would help the latter in what must be admitted to be a great difficulty in this era of multitudinous diversions.

A chance might also be given to the manufacturing departments to crow, as genially as possible, over the designing group by gathering together all their criticisms of the latter and their work, classifying them, and presenting a series of talks on "How designs should be made so as to help the shops."

Management Must Help

Such a plan could only be successful if the management were behind it wholeheartedly and were to insist on proper organization and administration. It would also be necessary not to take unfair advantage of the quickened production which would be required in order to release the daily study hour. The cost of the scheme would be negligible since the talent and equipment would already be available.

Another question not to be ignored is the future supply of experienced draftsmen. Some of us are familiar with the conditions in good times when the management invariably has difficulty in obtaining satisfactory men experienced in its own line and practices. Some of the former employees of the firm used as an illustration were doubtless still in town but not in other employment. Some of them would be glad to take advantage of the lectures, lessons and discussions as a means of keeping in touch with their work even though they would receive no remuneration. Thus the firm could keep track of such men and their development and a highly desirable first line of reserve maintained upon which to draw when business improved. Of course not all would stay available but at least the company would not lose any investment by the removals.

Operation of such a program would put a premium on positions with firms so doing and thereby enable them to exercise better selection of men.

III

An Individual's Reply

P. H. BRYANT

RECENTLY a machine tool designer of reputation, who for months had been in the ranks of the forgotten engineers, approached a manufacturer with what may possibly be a unique proposal in employment annals.

Enforced unemployment has been discovered to have many angles other than loss of income, and with some temperaments the reaction of these other factors upon the morale of the idle is likely to leave a more lasting imprint than the struggle to stretch the bank account. In the case in point, for example, the man was one who simply did not know what to do with himself around the house, yet all possible diversions such as auto trips, movies and paid-admission sports were banned, for economic reasons. As time went on and his efforts to make a new connection were unsuccessful, he began to be obsessed with the feeling that he was not only "out" but that he was being kept out by a definitely planned employment policy to take no chance of jeopardizing the jobs of those still employed by letting in competition from the outside.

In spite of the steady shrinkage of his cash resources and optimism, however, he at first had no thought but to cling to that illogical yet widely prevalent notion that having once lifted himself to an earning power of several hundreds per month, it would not only be undignified to seek connections rating very much below this established worth, but would permanently depreciate the value of his services. Months of futile effort to reconcile his present need with the maintenance of future prestige brought him to the point of a heart-to-heart talk with himself. As he expressed it to me, "I was on my way to no place but the bread line, yet I knew there were any number of plants right in my home city that could make use of my services if I could think of some way to match up my actual need with their enforced economies." That thinking evolved a plan, and he went to the chief engineer of the most promising prospect and after very frankly explaining just how he stood financially and that by the most rigorous economies short of actual privation he had reduced monthly requirements for rent and food to $50, he submitted the following proposal: That he be employed as a consulting engineer at a retainer fee of $50 per month; That in return for that compensation, he would put in all of the time his services could be used, doing any class of work for which his experience fitted him; That it was understood that he was seeking permanent employment elsewhere and could reserve in his own interest all the time necessary to continue his search for such a connection so long as such time out did not exceed two-thirds of any one month.

A Special Arrangement

In brief, a man worth under normal conditions many times the stipulated compensation, guaranteed an employer ten or more days work at $5 per day, and with no suggestion on the part of either that it was anything but a special arrangement to meet special conditions and one having no future significance.

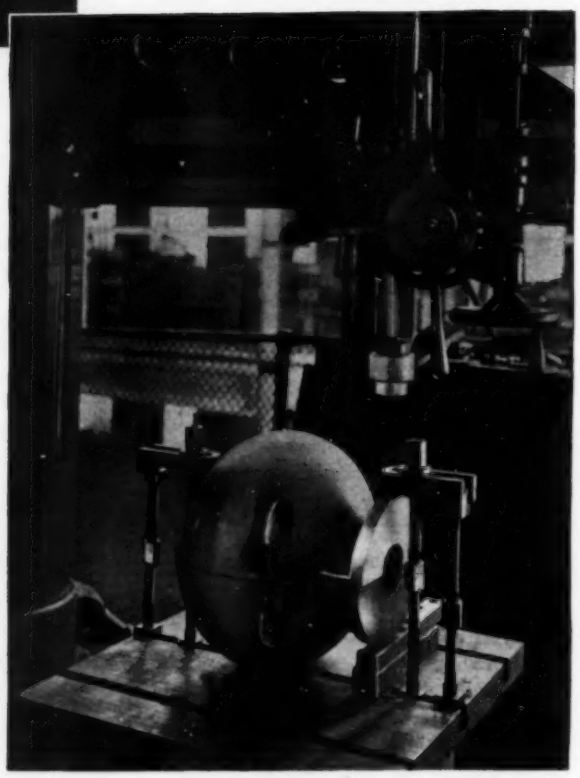
It was accepted and has worked out excellently. The agreement reads, "for a fee and other valuable considerations," and this particular man is finding that those other valuable considerations are not unimportant by any means. His whole attitude towards the future, and in contacts with friends and neighbors has changed. Even his physical forces are rejuvenated and he is in every respect a new man stripped of his restlessness and loaded with optimism.

Viewed from past standards it is a plan that anyone inclined to be critical could shoot full of holes, but in new times and under unprecedented conditions it is doing a whole lot for one man. Why would it not do as much for others?

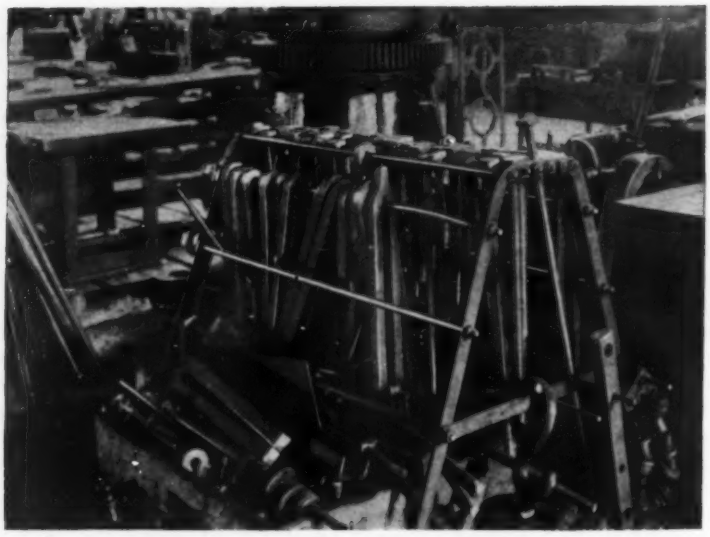
Extension Clamps for Small-Lot

A. E. FRISTEDT
Stockholm, Sweden

Probably the right length of bolt is here, but it takes time to find it. This kind of storage box for planer set-up clamps and bolts is familiar to many shops



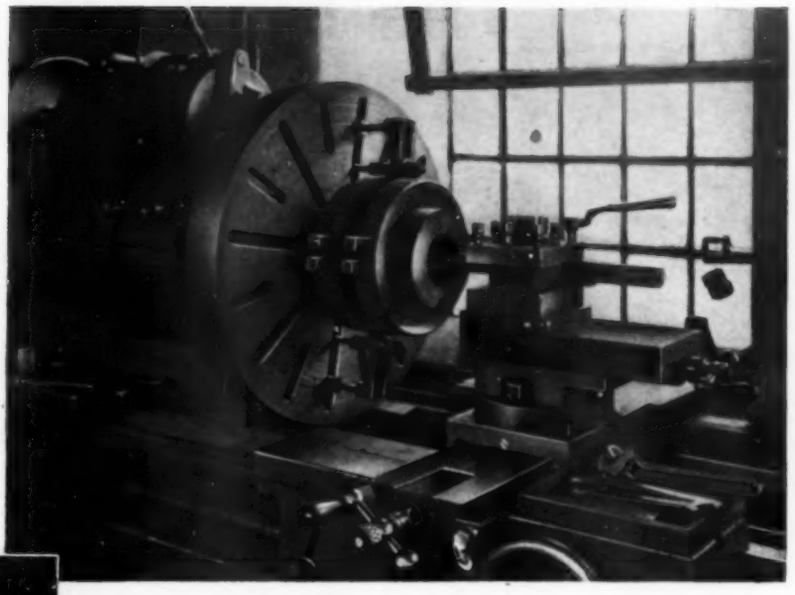
Held with adjustable bolts, this gear case forms a good example of a clean, efficient set-up. Hex nuts are convex at the ends so the straps will adjust themselves to irregular workpieces



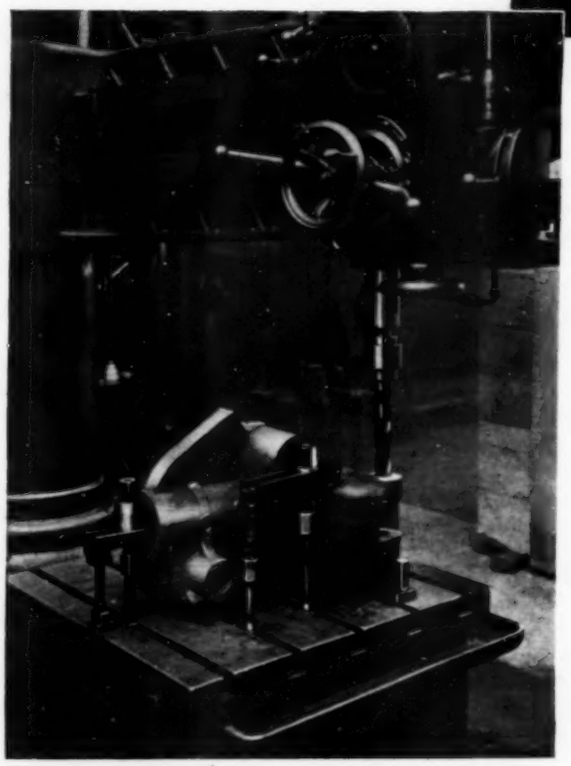
Another assortment of clamping equipment is found at the radial drill. Such accumulations were once thought necessary for handling small lot production

Set Ups

Accumulations of straps, bolts and washers are eliminated by a set of adjustable clamping units



Adjustable bolts are also used to support the outer ends of the straps. Heat-treated nickel-chrome steel is used for all clamping parts



This somewhat complex casting is clamped securely by the extension set. A table of dimensions gives the workman bolt combinations for various heights

A simple set of adjustable bolts and straps does the work of the old unwieldy collection. Small bolts are built into long ones to suit the requirements of each particular job

The First 100 Years

Brown & Sharpe Celebrates Its Centennial

IN THE environment of New England, the copartnership formed by David Brown and his son, Joseph R. Brown, at 43 South Main Street, Providence, early in 1833, had its birth and growth. Through 100 years of business life, this firm has been a leader in the evolution in lines of mechanical progress which have been fundamental in the great expansion which produced the present mechanical age.

Brown & Sharpe had its inception in a small clock and watch business. Some of the most important work done during these years was the building of tower clocks. That a reputation had been established for the quality of such work is shown by the following quotation from a letter written by Job B. Wilbour, a watchmaker of Newport, and published in the *Scientific American* of February 10, 1855. Referring to the clock in the old State House at Newport, designed and built by J. R. Brown, Mr. Wilbour says, "Our clock performs most admirably . . . I think it the most perfect timepiece in New England and see no way to improve any part of the machinery."

It was not until 1850 that steps were taken by Joseph R. Brown to branch out in pioneer work directed to raising the standard of accuracy in machine shop operations. In that year Mr. Brown built an automatic linear dividing engine, which, as far as is known, was the first put into use on this side of the Atlantic, and entered on the manufacture of standard rules for machinists' use. The next year he brought out the vernier caliper, reading to thousandths of an inch, which, for the first time, made it possible for accurate measurements to be made in the everyday work of the machine shop. This was followed a few years later by the manufacture of micrometer calipers, these two tools being of the greatest value in making possible the production of high-grade interchangeable work.

Another line of manufacture early taken up was in making appliances for measuring and weighing yarn; also the making of screw and wire gages. The American wire gage, having the sizes vary in a regular progression, was an original product of this company and one in the production of which Lucian Sharpe had a large share.

Lucian Sharpe, who had served an apprenticeship with Joseph R. Brown, became his partner in 1853, and from that time on the business prospered, agencies being established and the products widely advertised. Mr. Sharpe's executive and business ability showed strongly from the start.

In 1866, Samuel Darling, of Bangor, Maine, who had commenced the manufacture of steel rules soon after Mr. Brown, formed a partnership with Messrs. Brown & Sharpe, and in 1868 moved his plant to Providence. This part of the business was conducted under the name of Darling, Brown & Sharpe, until January 1, 1892, when Mr. Darling's interests were bought out, and the entire business was soon after conducted under the name of the Brown & Sharpe Mfg. Co., the old firm of J. R. Brown & Sharpe having been incorporated under that name in 1868. Mr. Darling was an unusually fine mechanic, and devoted the best years of his life to the work of devising tools and methods for raising the standard of accuracy, taking out during his lifetime more than fifty patents.

The business had just developed to a point where the impetus given it by the

D. BROWN & SON—WATCH, CLOCK MAKERS &c., have taken the Stand No. 43 South Main street, Sign of the Turret Clock, where they offer their services in the above business.

They will give ocular demonstration that they are prepared, and by assiduity will show themselves qualified, to supply many of the wants of others to their satisfaction.

They will pay particular attention to repairing Watches and all other Time Pieces that may be offered, and make such as are called for. They have for sale, 1 Turret Clock, and 1 large Cutting Engine, on an improved plan.

They have a Dividing Engine for making the most accurate graduations for Mathematical and Nautical Instruments, and will attend to making and repairing such as are ordered. They intend to exhibit specimens of their own production, for sale.

Dividing Plates for all sized Engines graduated in the most perfect manner.

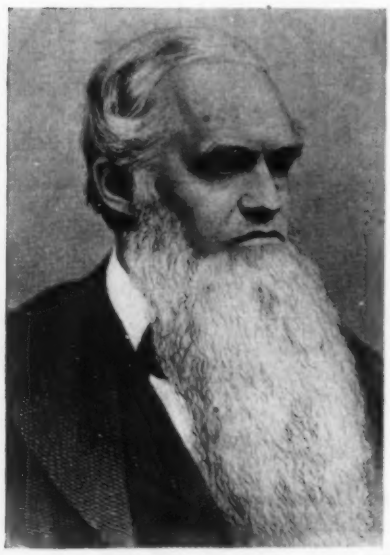
Spur, Spiral and Bevel Gear, and Screws for Worm Gear. Tops, &c. for repairs of Spinning Machinery, turned and cut as directed.

Various Jobs will be punctually attended to.

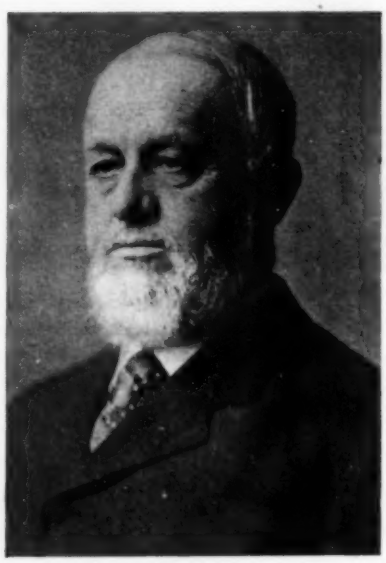
After having been to great research and expense, and arrived to do the above work with despatch by manual labor only and individually, they think they need only to be known to have steady business.

DAVID BROWN,
JOSEPH R. BROWN.

On April 22, 1833, this advertisement appeared in the Providence Daily Journal, evidencing the beginning of the business of the Brown & Sharpe Mfg. Co.



JOSEPH R. BROWN



LUCIAN SHARPE

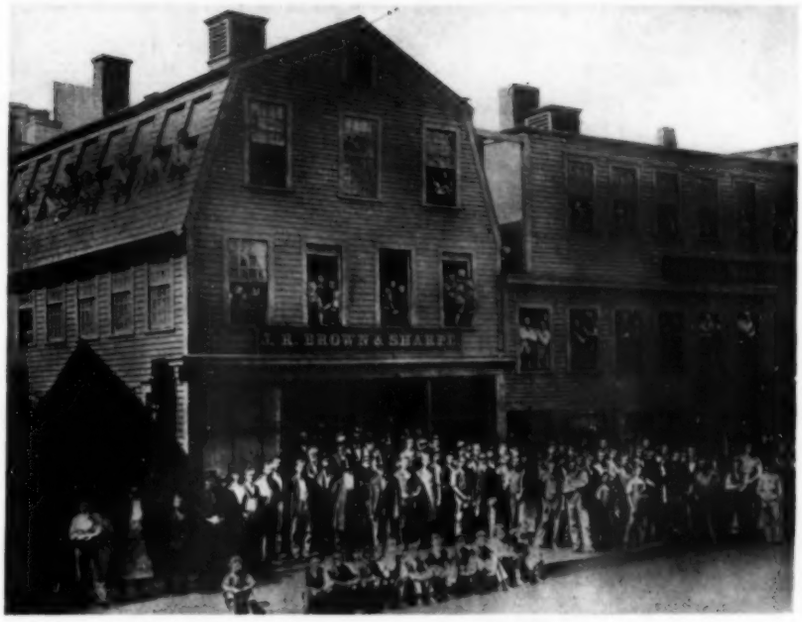
breaking out of the Civil War and the demand thus caused for a large increase in manufactured products, led to a great expansion and to many inventions. Among the most important of these was the invention by Mr. Brown of the universal milling machine. This was brought out in 1861-2 and was designed to use in connection with the production of firearms, and also in the manufacture of sewing machines. J. R. Brown & Sharpe had contracted just before this time for building the Willcox and Gibbs sewing machine. It might be said, in this connection, that Brown & Sharpe have since that time built many hundred thousand of the various designs of these sewing machines.

A line of manufacturing milling machines was also brought out during war times, especially useful in producing interchangeable parts in large quantities. Following the invention of the universal milling machines, plain milling machines of the column type were designed, and both these and the manufacturing type have become part of the regular line since carried.

Connected with the invention of the milling machine was that of the formed cutter, which can be sharpened without changing its form, also Mr. Brown's invention. This was an important step in the production of accurate cut gears, as well as for general manufacture.

As early as 1855, J. R. Brown & Sharpe had built a precision gear cutting machine, having gone to great pains to have this machine of a high degree of accuracy, and in connection with their gear work, they took an important part in establishing the standard system of interchangeable involute gearing that has since become so universally adopted.

In connection with the production of war materials, the turret screw machine also played an important part. The Brown & Sharpe Company commenced its manufacture in 1861, and added many important inventions to increase its usefulness. These were followed by more fully organized screw machines, leading up to the fully automatic machine of the present day. The invention of the automatic machine has made it possible to produce an infinite variety of small parts aside from screws, not only in great quantities but also to a high degree of accuracy.



Old works as it appeared in 1872, just before the company moved to its present location

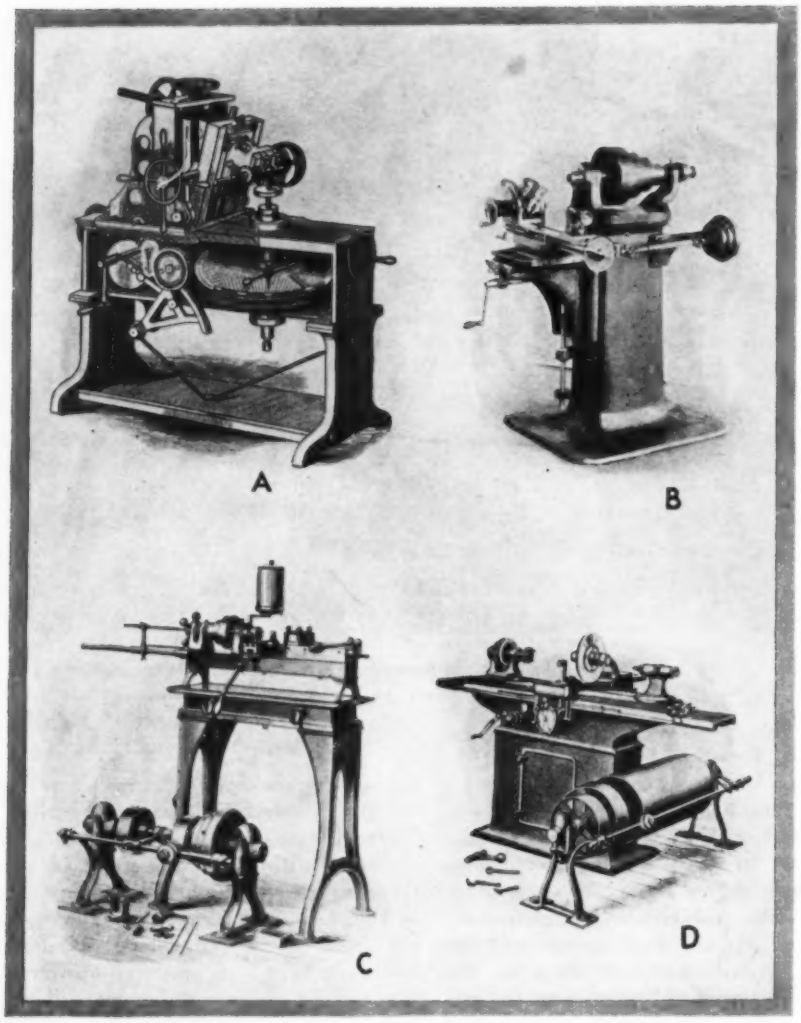
The universal grinding machine, another of Mr. Brown's inventions, was evolved from crude beginnings for the purpose of grinding hardened sewing machine parts. This gradually developed into the full universal grinding machine, completed by Mr. Brown shortly before his death in 1876.

A writer who intimately knew Mr. Brown and his work recently said: "What I consider Mr. Brown's greatest achievement was the universal grinding machine. In developing and designing this machine, Mr. Brown stepped out on entirely new ground, and developed a machine which has enabled us to harden our work first and then grind it with the utmost accuracy." He further says: "This in my judgment is one of the most remarkable inventions, and too much cannot be said in its praise, or in acknowledgment of Mr. Brown's perseverance, wonderful initiative and genius."

One of the most important fields of endeavor with which the name of this company has been closely associated is in the making of standards. The masters from which commercial standards are made have been produced at a great expenditure of time and money. These are the standard screw lathe cutting screws within a guaranteed limit of less than 0.0004 in. error, in a foot; measuring machines reading to 0.00001 in., and based on linear standards made with great care which have been compared with the government standards at Washington; circular dividing and index drilling machines.

In the early days the business was carried on in a wooden building not specially adapted to the work; but in 1872 a new fireproof factory was erected at a location about a half mile from the business center of Providence, being especially suited to the needs. The growth has since been around this build-

Today the Brown & Sharpe buildings have a total floor space of over 32 acres



Brown & Sharpe designed and built the originals of many types of machine tools in general use today: (*A*) precision gear cutter and index drilling engine, 1855, (*B*) original universal milling machine, 1862, (*C*) No. 4 screw machine, patented by Joseph R. Brown in 1865, (*D*) original universal grinding machine, 1875

ing until now the ten main manufacturing buildings have a floor space of about 900,000 sq.ft., the foundry about 245,000 sq.ft., and the forging, hardening, central power plant, and miscellaneous buildings about 264,000 sq.ft.

Pains have been taken to make these buildings sanitary, and to provide for the comfort of the workmen. There has been a well organized apprenticeship system since the beginning of the business, there being a school connected with the factory where the apprentices are given instruction under the supervision of an instructor during working hours. Hundreds of Brown & Sharpe apprentices have gone to all quarters of the globe after completing their courses, adding to the host of inventors and manufacturers of mechanical products. Many not only have achieved well merited success in their individual work but have also become figures of national importance in manufacturing. Prominent among these was the late Henry W. Leland, president of the Lincoln Motor Car Company.

The Brown & Sharpe Co. has received the highest awards in all cases where they have exhibited, including international expositions, at London, in 1862, Paris 1867, 1878, 1889 and 1900, Vienna 1873, Philadelphia 1876, Chicago 1893, Brussels 1897 and 1910, St. Louis 1904, Liege 1905, Milan 1905, Turin 1911. Medals have also been received for work done in safeguarding and sanitation in the factory.

Of the exhibit at the Centennial in 1876, it was said: "Accurate tools like these produce accurate and interchangeable work, cheapening the production and at the same time giving that perfection which is becoming more and more indispensable in the sharp competition attending the manufacture of machinery."

At the Brussels Exposition in 1897 the "Grand Prix" was awarded to but three machine tool makers, the first of these being the Brown & Sharpe Mfg. Co. At Paris in 1900 this company again received the highest distinction, the report saying regarding their exhibit that, "the award of the Grand Prix was not only a distinction in itself, but the fact that an award of 24 points out of a possible 25 was granted their exhibit of machinery and tools shows that they were also recognized by the jury of awards as superior in every way."

Care of Measuring Instruments

JOHN MARK MAY

Although accurate measuring instruments are reasonable in price, considering the quality of material and the skilled workmanship required in their manufacture, they are entitled to much better care than they sometimes receive, both from an economic standpoint and because of impaired accuracy due to improper care and handling.

Not long ago, in a shop where more than the average accuracy is required, I saw racks of outside micrometers (varying in size from about 4 to 30 in.) placed close to a window. The racks were parallel to the window, leaving nothing but glass between the micrometers and the outside temperature, which fluctuates in that climate from about 90 deg. above to 15 deg. below zero. The window had an eastern exposure, without anything to protect the tools from the direct rays of the sun from sunrise until about one o'clock in the afternoon.

While the changes in temperature that occurred during each 24 hr. might not quickly nor very seriously affect the micrometers, providing they were brought to room temperature before being used, it certainly does not look as though the tools were being properly cared for. There was plenty of room in just as convenient places where the room temperature was not affected to such an extent by conditions that always obtain near an outside wall, or a window.

A better storage place for the tools would lessen the hazard of a careless workman using one of them before it had been brought to the temperature of the work to be measured, which is an item that is obvious if accurate measurements are to be made. It should be the toolroom's job to preserve the accuracy of instruments in its care.

A drop of lard oil applied to the external thread of a prussian blue tube will prevent the cap from sticking without the necessity of carefully cleaning the threads each time the tube is laid aside between jobs.

Bearings for the Soviets

Part II—Specifying the Product Selecting the Materials

FRANK SCHUBERT

Typical of the workings of the Russian mind is the author's description of the "trial by argument" to determine which type of bearing steel to use. It explains much that we have found difficult to understand about Russian industrial development

OFFICIAL Russia planned to produce in the Kaganovitch Bearing Plant four general types of anti-friction bearings, i.e., ball bearings, tapered roller bearings, cylindrical roller bearings, and helical roller bearings—approximately 120 sizes in all. The ball bearing types included the magneto type, the single row radial (some with grease shields), the angular contact, the double row, the single and double thrust, the self-aligning, and a few simple ball and separator assemblies without rings—a total of 53 sizes. The sizes ranged from E12 to 318.

Included in the tapered roller bearing types were the single row, the double row (some with split outer rings and some with split inner rings), and the self-contained thrusts for steering pivots —a total of 35 sizes. The sizes ranged from about 40 mm. outside diameter to nearly 200 mm.

Other Types of Rollers

Cylindrical, or "solid," roller bearing types included the Hoffmann or international type, the small outer ring with inserted end plates holding rollers in position, but with no inner ring, and the separator and roller assemblies without rings, but the bulk of the production of the cylindrical roller bearings was to be of the wide, removable outer ring type, with rollers greater in length than in diameter—a total of nine sizes. The sizes ranged from 40 mm. outside diameter to 160 mm.

The helical roller bearing types were to be many and various, i.e., roller and separator assemblies, to which would be added split or rolled outer rings, with or without inner rings, and solid outer rings with solid or no inner rings—twenty-odd sizes in all ranging from the small fan-shaft separator assemblies to complete bearings large enough for wheel hubs.

Lack of General Standards

Since each of the varieties of the four general types of bearings has many design variations, as produced by the four or five principal bearing producing countries, by the second week in March, 1930, the design had not been definitely determined for any one type of bearing. The director of the commission wanted to call a conference of some of the leading American automotive users of anti-friction bearings to settle upon these design questions. At his request I arranged with about seven engineers to attend such a conference but without explanation the conference was canceled, and the design problems were thrown back on the division assistants to the chief engineer. One of these division assistants insisted that aside from the questions of general type designs (of separators, etc.) it would be impossible to complete the detail designs of his group of bearings without adding a staff of experienced detailers for his particular group of bearings. However, the work proceeded, every design type adopted being well supported by lengthy documents on the whys and wherefores.

Some of the questions of design to be settled can be listed to give an idea of the quantity of them, aside from questions of materials.

Ball Bearings—English or metric ball sizes, (Russia prefers the metric system); notched or unnotched type single row radial bearings; width and thickness of separator plates; solid or separable rings for double row bearings; one piece or built-up separators for double row bearings; and for angular contact bearings; grease retaining or "plain" separators for thrust bearings; depth of ball "grooves" or "races"; size and number of balls.

Tapered Roller Bearings—Old or new type "rib"; "L" or "Z" shaped separators or without stiffening flanges; standardization of roll sizes where conical angles varied only a few minutes of a degree; standardization of rib angles.

Cylindrical Roller Bearings—Lapped or ground rollers; ends of rollers with radii or with chamfers; cast or forged separator rings for Hoffmann-type bearings; one-piece or built-up separators for wide type bearings; ribs finish-faced before hardening or ground after hardening; running clearances; ends of rollers ground or not ground after hardening; selection of one of four types of separator for needle-type rollers (involving plain, countersunk or nibbed ends for rollers).

Helical Roller Bearings—Breaking down long rollers so as to make two separator assemblies of shorter rollers; welded or spun spacer rivets for separators; full complement of rollers for separator, or the staggered type; standardization of dimensions of raw material sizes for rollers; hard or soft end plates for separators; cyanide-hardened or "soft" outer rings of the split or rolled type; specification of depth of case for "solid" rings.

Many of these questions of design involved quality of finished product as well as variations in production processes. Often the project was laid out complete for both of two possible designs.

Some of these questions may seem academic, but it is to be noted that either side of nearly every problem could be supported by a product made by one or more of the bearing manufacturing companies in America or in Europe. It would have required a rather complete historical knowledge of bearing development, on the part of the Russians, to have been able to make these decisions promptly. In some instances a purely historical outline of design development was all that was necessary to reach a decision.

In addition to these problems of design there was the ever-present problem of tolerances, not only tolerances of external dimensions, but also those of internal dimensions. The S.A.E. tolerances on external dimensions of ball bearings do not coincide with the so-called International Conference standards, these latter being more rigid. The majority of the original quotations and guarantees of the American machine builders were based upon S.A.E. standard external tolerances for the ball bearings. These should have been satisfactory, since all of the bearings to be made were to be used in automotive equipment, and the automotive units to be built were copies of American units, with the exception of the one to be produced in the very smallest quantities. Hence, the external tolerances for the ball bearings were a problem of discussion in America, in Italy, in Germany and in Russia. The same thing applied, in greater proportion, to the other general types of bearings, for on these there were no S.A.E. tolerances.

Official Russian Standards

Now, there had been issued in Russia, along with a great mass of general engineering standards, standard tolerance tables for many sizes of anti-friction bearings. These were in agreement largely with the International Conference standards. Only a few years ago it was an offense against the state to issue designs carrying other than these standards. Final agreement was reached in Moscow, in the spring of 1932, on tolerances for both external dimensions and internal dimensions; those for the former being based largely upon the International standards, except where tolerances on nominal sizes for similar dimensions of dissimilar bearings were not identical; those for the latter being based upon the ability (or accuracy) of the equipment purchased to perform the operation on the various internal dimensions or processing operations.

As the project progressed, the tolerance problem appeared in connection with gages and gaging devices to be used in both routine and checking inspection operations. American standards for these tolerances were abandoned, at the outset, as having too great allowances for wear. The German or DIN Standards then were proposed and recommended by one group of foreign specialists as being almost universally in use in Europe. But the Russian technical staff proposed Russian standards, which lie somewhere between those of DIN and the American. The fact that the discussion on gage tolerances was being continued into the summer of 1932 (after production had actually started), paved the way for several compromise proposals, by both Russian and foreign engineers, which only complicated the issue.

Such issues remaining long unsettled were, and from the news in the press, continue to be points upon which foreign specialists base charges that they do not receive whole-hearted cooperation from Russian technicians and executives; anything but an almost blind acceptance of "foreign" proposals being classed as "lack of cooperation". With an entire industrial plan in the process of development, it would appear that the Russians are, at times, justified in insisting that the problem is basically theirs and that a technical and production program based on their needs and fitting their conditions is quite a logical demand. This is not to say that everything for Russia must be "tailor-made" to fit their conditions. But there will be disappointment in store for the supplier of equipment or services to the Soviet, should his product or his plans be based solely upon American conditions. While on service there, the writer heard more than one confession made by suppliers of foreign equipment to the effect that it was regretted that certain units had been furnished before a thorough survey of requirements had been made by competent observers.

Soviet Russia decidedly is not an opportunist market. A homely case in point was the operation of an American-made automobile in Moscow. This particular car had given 40,000 miles of excellent service in the United States, on two sets of standard production tires. The first week's service in Moscow destroyed two new American-made tires and the warning signal proved entirely inadequate for the almost constant use

Inspection of outer rings before polishing. Racked rings in front of the window are Number E 12's, those on table, Number 315's

required of it there. The extremely low winter temperatures in Moscow and the lack of de-waxed oils required such generous use of the hand starting crank that two were replaced in one winter!

Materials to be used in the production of the various types of bearings were the subject of long conferences extending over a period of nearly two years. Before leaving America, com-

Loading tapered rolls in a separator disk for final grinding in a vertical "lapping" machine built by Fiat

plete buying specifications had been prepared for every type of steel required, but upon completion of the specifications the metallurgical group of the staff stated that these would be of no use, since we would use steels that were already standardized in Russia. Later developments proved that, as in other countries, nothing is "special" if it is purchased in sufficient quantities.

There was very little question about the specifications of material for ball bearings, this being almost universally the same wherever ball bearings are made: one analysis for the rings and two different analyses for small and for large balls, all three being high carbon, high chromium steel. There was to be determined then, only the questions of tubing or forging bars for the annular bearing rings, and of forging bars or strip stock for the thrust bearing rings. Since there was no high carbon tube mill available in Russia, and the capital outlay for one would be several million dollars, forging bars were decided upon for the annular bearing rings. Ball bearing strip steel has been a notoriously difficult steel mill problem, and again a press problem. So, finally, it was decided to specify plate tolerances at the mill and to hot-shear and to hot-flatten, followed by annealing, before machining.

For helical roller bearings the material specifications were fairly well defined, the material discussions for this type of bearing being confined largely to the correct depth of case (and how to specify it) for the solid or uninterrupted type of rings, and whether or not to cyanide harden the interrupted or rolled type of rings and the separator rings. Some members of the staff could not believe that the cyanide process was ever used on either the interrupted race rings or the separator rings. Investigation proved there was no apparent standard practice on this subject. The final decision was based on Ford practice for bearings to be used in Ford-type units, and on the latest available commercial bearings for those to be used in other units.

For cylindrical roller bearings the original plan was to use ball bearing steel for the Hoffmann-type bearings (which were to be supplied for Yaroslav five-ton trucks and buses), and to follow the practice of International Harvester for the bearings to be supplied for the Stalingrad and the Kharkov units. This decision meant considerable carburizing which they were endeavoring to avoid because of the alleged excessive cost and uncertainty of the necessity for jig-quenching the larger rings. It was suggested, therefore, that a steel similar to SAE 6150 be used for these rings, but since there was no certainty as to the availability of this steel, the American project was set up to use bearing steel forging bars. Regardless of the ring material to be used, the cylindrical rolls were to be made of bearing steel rods.

American Practice Questioned

Since the American practice for automotive sizes of tapered roller bearings was to use carburizing steel for rings and rolls, this was adopted in the project developed in the United States, although the metallurgical group of the Russian staff again feared the possible difficulties from distortion in quenching. When technical conferences began in Moscow, in the fall of 1930, it was learned that this question of material for tapered roller bearings was by no means settled. It was to be the most important subject for discussion in conference.

A foreign engineer attached to the Moscow staff had just returned from Zlatoust, where the first Russian ball bearing steel had just been made. His report and samples, together with many photomicrographs, indicated an excellent product. The Zlatoust ores being of a quality comparable with that of the long-famed Swedish ores, this indicated a continued supply of good bearing steel in quantities dependent upon mill capacity. Requests were made for reports substantiating the American decision to use carburizing steel. Recommendations so made were based upon the increased first cost of material, the greater initial investment in additional turning equipment required, the continuing in-

creased cost of labor, and—of greatest importance — the tremendous extra burden on the steel mills which already were overloaded. This last was countered by the statement that the increased bearing steel requirements would be possibly 60,000 tons a year, whereas the mill capacity was 164,000 tons. In later conferences, it developed that the 164,000-ton capacity was the projected capacity.

About the middle of October, 1930, it was announced that the State Metal Industry had decided, on the basis of information submitted, to supply carburizing steel for tapered roller bearings. But the pressure from the metallurgical staff, and from the largest group of consulting specialists, forced another and general conference on the subject. This general conference was attended by the staffs of the automotive, the metal, and the bearing "Trusts," together with many of their foreign specialists. It was a conference long to be remembered. Apparently, the conference was to be a sort of trial by argument, at which an appointed commission was to act as jury. These conferences always followed a definite plan, rigidly held in order by the chairman: arguments or evidence, questions, refutations or comments, and then the decision. In this instance the evidence to be presented had been prepared by two groups holding widely diverging opinions, but each undoubtedly sincerely positive that its arguments were sound and could therefore lead to only one decision which, of course, was its own conclusion.

The Arguments Advanced

For Ball Bearing Steel: High carbon, high chromium bearing steel is admittedly better steel than low carbon steel, because it was particularly developed for the production of anti-friction bearings; we have sufficient mill capacity projected to more than cover our needs; all tapered roller bearings made in Europe are made of bearing steel; carburizing steel is used in the United States because bearing steel cannot be successfully annealed in any but electric furnaces and the cost of electric current "over there" is too high to permit its use in the production of steel to be used in bearings sold as cheaply as these are; the increased melting and mill cost of bearing steel over carburizing steel *is* only 20 per cent in Russia, whereas, in other countries it is reported to be 40 per cent; excessive scrap losses in quenching of carburized rings through distortion in quenching, together with cost of the carburizing process, would result in a higher total cost of rings ready for grinding; possible increased cost of production would be offset by the increased service rendered (citing length of time required by a Russian garage to disassemble and reassemble a Ford rear axle); if it is too expensive to make tapered rolls of bearing steel by the heading process, use carburized rolls which would have greater life anyway because of greater resiliency, but the rings must be of bearing steel since they are the first parts to fail in service.

On the Other Side

For Carburizing Steel: Ball bearing steel is one of the most difficult steels to produce uniformly good, and it will be a costly mistake to add this extra burden on capacity still requiring exploitation to meet our requirements for only ball bearings; greater difficulties and hence higher costs in the ring forging department, if bearing steel is used; greater investment in ring turning equipment required for bearing steel, together with continuing greater labor and tool costs in the ring turning department; bearing steel can be correctly annealed in furnaces employing any one of three kinds of heat source, but no annealing of rings forged of carburizing steel is required; although it may be conceded that the units which will use the tapered roller bearings will be subjected to more severe service conditions in Russia than they are in the country where their designs were originated, the bearing sizes selected by their original designers offer a sufficiently high factor of safety to meet Russian loading conditions; inadequate maintenance or lubricating service will result in equally poor service experience whether the bearings are made of bearing steel or of carburizing steel; careful investigation of European-made automotive products would reveal two facts concerning the use of tapered roller bearings in such products, they were not used in such huge quantities as Russian production programs require, and for various design reasons not affecting the bearing primarily the bearings used were in many cases smaller in size than those used in comparable mountings in America; it is difficult to determine, without long laboratory tests, the probable difference in load carrying capacity of tapered roller bearings made of bearing steel over the same size bearings under identical operating conditions, this difference certainly could not be expected to be more than 20 per cent and that percentage added to a factor of safety already ample is insufficient to offset the experienced fact that bearings made of a comparably good quality of steel of either specification would require replacement, in the great majority of cases, because of worn parts, long before either material had reached its fatigue limit.

With that the carburizing steel advocates rested their case, but the bearing steel advocates had one more argument, presented by a foreign specialist. It was impressively read from an American handbook, and it consisted of one of the earliest empirical formulas developed for estimating the load carrying capacities of anti-friction bearings in which the constant K was intended to vary with the grade of material used. By substituting, in effect, $\frac{K}{2}$ for carburizing steel, the argument appeared to be clinched, the Commission deciding in favor of bearing steel.

As has been noted, this plant was intended for the production of a predetermined schedule of anti-friction bearings. It was inevitable that in the development of initial production there should be an unbalanced machine-load condition. Early in the spring of 1932, representatives of other projects had seen idle equipment in the bearing plant, waiting for material or for the balancing out of a given production line, and consequently sub-contracts were placed with the bearing plant for rush orders of various truck and tractor engine valves, piston rings, piston pins, and some strictly grinding jobs. The spring plowing and sowing season was at hand and the repair parts demand for equipment unused throughout the winter was in excess of production. Many of these sub-contracts, however, entailed delays in receipt of tools and materials so that they presented problems greater than could be solved by machine capacity alone. Therefore, very little of this sub-contract work was done except that which could be performed on machines of the Blanchard and the centerless types. All such work was eagerly welcomed by machine operators anxiously awaiting their first opportunity to produce on the machines long since assigned to them.

(Second article of a series. The first article appeared in Vol. 77, No. 8, page 229.)

Gear Train Design

Bulletin No. 14 on "Gear Train Design" by Professor William H. Rasche of the Virginia Polytechnic Institute describes the application of Brocot's tables to the determination of gear trains to meet specified decimal ratios. This publication is a second edition of Bulletin No. 2 which appeared in 1925.

The author points out that one of the methods of gear selection presented in a discussion on "Change Gears for Gear Cutting" (*AM*—Vol. 76, page 999) had been previously included in Bulletin No. 2.

EDITORIALS

AMERICAN MACHINIST
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K. H. CONDIT F. H. COLVIN
EDITORS

Revolutionary Control of Industry

Secretary Perkins' draft of a bill offered as a substitute for the Black thirty-hour week bill is further evidence of the willingness of the new administration to experiment with new ways of dealing with economic problems. It is also proof of a determination to regiment the nation on a scale not dreamed of even during war times, if it becomes necessary as a reconstruction measure.

What will happen to this draft in Congressional committees and on the floor remains to be seen, but at this writing there is reason to believe that Miss Perkins' plan will become law without very drastic change. As it stands now, the authority granted is permissive rather than mandatory, which is also characteristic of the farm bill. The tools to work with are thus made available to the administrative officials of the government but the officials are allowed discretion in their use of them.

From the standpoint of American industry this bill is probably the most portentous one that has been introduced in many years. If carried to its ultimate conclusion the political philosophy embodied in the bill would lead to complete control of industry by the state, a goal not far removed from the one sought by the leaders of Soviet Russia. Whether that goal is reached depends largely, we believe, on how quickly the forces of recovery can counteract the forces of deflation. The powers voted to the administrative officials, being permissive, need not be used if revival comes without them.

In any event every individual in the metal-working industries is likely to be affected by the results of this piece of legislation. Its progress should be watched with care. As proposed, the bill establishes a thirty-hour week for industries engaged in interstate commerce, and a forty-hour week during a period of ten weeks in any year for some seasonal industries. It authorizes the Secretary of Labor to take steps to prevent over-production in individual plants, or in whole industries, thus nullifying certain parts of the anti-trust laws. It permits the setting-up of wage boards in localities or in industries where the establishment of a minimum wage seems desirable.

No two industries will be affected alike by this bill. Process industries, for example, have already been successfully operated on four six-hour shifts. On the other hand, very few machine tool builders or other makers of precision machinery have ever found operation of more than one shift satisfactory. The reasons are obvious to readers of *American Machinist*.

Unquestionably this bill will accomplish many of the things sought by manufacturers who have urged modification of the anti-trust laws. It is also clear that the inevitable increase in labor wage rates will stimulate the market for machinery and production equipment. It will relieve unemployment in the near future but what will be the effect in the long run? Employers generally have shown a remarkable spirit of social responsibility toward their employees during these hard times. Will they continue to feel this responsibility if government steps in to control their operating policies?

At the same time we are seriously apprehensive of the results of putting such power over industry into the hands of bureaucrats. The present Secretary of Labor has the very general respect of industry, but what might happen if a less conscientious person occupied the position? And we may as well recognize that power of this magnitude, given to a government bureau or department, is very hard to withdraw.

On the whole, revolutionary is a mild adjective to apply to the "Bill to Regulate Labor." Watch it!

Index of Machine Tool Prices

Price indexes of steel, sugar and other commodities show a decided drop since 1929. With this in mind statistical enthusiasts ask us for an index of machine tool prices on a similar basis, and wonder why it is not available.

It seems to be extremely difficult for most engineers to realize the difference between machine tools and commodities. Steel and sugar remain practically the same and prices are readily comparable from year to year. But it is impossible to compare machine tool prices on that basis.

Almost without exception machine tools today have been greatly improved over machines of similar capacity five, or even three years ago, so that price alone is no means of judging the value. Low carbon 1020 steel is the same material it was five years ago, but the machine that drills, forms and threads it into useful products has been greatly improved in every way. The machine now does better work and more of it than ever before. Even at the 1929 price its cost is decidedly lower in terms of the value of its product.

Had machine tool builders been content to let well enough alone they could have reduced prices considerably. Instead they have spent hundreds of thousands of dollars in the designing and developing of new machines and in improving the old ones. They have

kept hundreds of men employed when employment was the crying need of the country. The machines they offer today are the best that have ever been available for economical production.

These machines cannot be sold at prices that compare with the drop in standard commodities. It would be just as unreasonable to expect to buy high speed steel at the price of 1020, or tungsten carbide at the price of high speed steel. It is what you get for the dollar that counts.

Educational Munition Orders

A bill authorizing the Secretary of War to place so-called educational munition orders with others than low bidders has been introduced in the House by Representative Goss of Connecticut. It is known as H.R. 123. Mr. Goss has asked the Military Affairs Committee to hold hearings and until this is done the bill can make no progress.

Originally proposed as a national defense measure this project was advocated last year as a means of unemployment relief in the metal-working industry. Today it would still serve the latter purpose, and in addition it would help to plug some of the gaps likely to be made in the national defense scheme by the drastic reduction in Army appropriations.

Readers of *American Machinist* are requested to review the effect of the placing of such orders with their own organizations and to be prepared to participate in an effort to support H.R. 123 if it can be brought up for consideration at this session.

• CHIPS •

President embargoes gold exports in decision to let dollar seek its economic level abroad . . . Follows up with controlled inflation measure as amendment to farm bill . . . Stock market reacts with rising prices and immense turnovers . . . Commodity prices soar as industry buys heavily to cover future needs and speculators jump in to anticipate inflation . . . London and Paris taken aback and talk of retaliatory measures to preserve relative positions of their currencies . . . Dollar drops sharply abroad . . . Opinion here differs on wisdom of move but majority favors it.

Roosevelt urges legislation to provide two billion mortgage refinancing for small home owners . . . Asks governors of thirteen industrial states for minimum wage laws for women and children . . . Insists on slashes of $144,000,000 in War Department . . . Plans to furlough 4,000 officers on half pay . . . Asks authority to slash Independent Offices appropriation . . . Senate refuses to amend Black 30-hour bill and sends it to House . . . Administration offers substitute that would permit government control of industry . . . Protests arise from many sources . . . National Industrial Conference Board estimates increase in jobs at 1,000,000 . . . Woodin assembles Federal Reserve governors to plan liquidation of closed bank assets . . . Senate committee agrees on banking reform bill terms . . . Awaits word from administration before reporting . . . A half billion of Treasury notes are issued with an eye to the small investor and to tempt hoarded funds.

Germans urge support of Mussolini's four-power pact . . . Japanese troops drive south of great wall . . . Threaten Tientsin and Peiping . . . Americans prepare to leave . . . Japan suggests another foster state like Manchukuo for region . . . Unemployment drops in Italy . . . Soviet imprisons two British engineers, releases one, expels three . . . Trial not convincing from Western viewpoint . . . Too many political propaganda speeches by prosecutor . . . Mention is made of $7,500,000 owed by Soviet to Metro-Vic . . . Great Britain prohibits imports of Soviet goods . . . MacDonald and Herriot arrive for economic conversations with Roosevelt . . . President denies intention of engaging in currency debasement contest . . . Says embargo order was occasioned by internal conditions . . . French experts discuss reciprocal tariff reductions . . . Nazis gain in Austrian elections.

Business failures continue to decline . . . Farm Board disposes of all May wheat holdings . . . Also out of cotton and expects to dispose of other small holdings shortly . . . Wholesale commodity price index rose 0.7 per cent from February 15 to March 15 . . . Export trade balance $13,000,000 in March . . . Eugene Meyer resigns as Federal Reserve governor . . . Succeeded by Walter W. Stewart.

Steel production increases sharply on strength of automobile activity . . . Fourth straight gain in weekly index . . . Nearly doubles March low record and is ahead of same week in 1932 . . . Scrap prices increase, as do prices of galvanized sheets . . . Non-ferrous metal prices up . . . Holders reluctant to sell much at current rates . . . Electric output gains but is not quite so close to 1932 figure as in previous week . . . Industrial sales of electrical equipment gain . . . Rise in carloadings keeps 2,000 men busy at West Albany shops of N. Y. Central . . . Tennessee Coal and Iron recalls 700 men at Birmingham for at least a week's work . . . Pennsylvania R. R. trades 100,000 tons of scrap for 25,000 tons of rails . . . Flood damage grows in New England . . . Automobile orders gain and plants speed up . . . Chrysler announces two new Plymouth models . . . Week of April 15 sales largest since last June . . . Automatic transmission to be a feature of the new Reo . . . Macon makes a successful 13-hour trial flight . . . March exports of agricultural equipment rise 53 per cent over February.

Machine Tool Index Again Drops

A slight drop in the March index of gross orders as compiled by the National Machine Tool Builders Association reflects the effects of the closing phases of the banking holiday. The latest figure is 13.4 as against 15.2 for February. The three months' average also reached a new low at 20.1. The index of shipments and index of unfilled orders were off with figures of 21.8 and 27.7 respectively.

Domestic demand has been squeezed to the lowest point on record by the financial situation and readjustment legislation. Foreign orders account for about a third of the total.

March Orders for Machine Tools

	Index A	Index B	Index C	Total
Number of reports	24	28	23	75
Class bases	$2,491,946	$680,503	$133,419	$3,305,868
Gross orders for month	13.0	11.9	28.7	13.4
Cancellations	0.1	0.1	0.1	0.1
Net orders	12.9	11.8	28.6	13.3
Shipments	22.2	22.2	12.6	21.8
Unfilled orders	21.6	40.9	72.1	27.7
Three months' average of gross orders	21.2	14.6	26.1	20.1

Base — Average shipments for years 1922-24.
Index A — Base more than $50,000.
Index B — Base $10,000 to $50,000.
Index C — Base less than $10,000.

Machinery and Construction To Be A.W.S. Topics

On April 27-28, the fourteenth annual meeting of the American Welding Society will be held at the Hotel Governor Clinton, New York City. The business session will be opened at 10 a.m. by the society's president, F. P. McKibben. Committee meetings will occupy the afternoon of the opening day. In the evening Professor McKibben will lecture on "Erecting Steel Buildings and Strengthening Steel Bridges by Welding."

On Friday morning April 28, the following addresses will be heard: "Must Industry Be a Pawn or a Power?" by Charles F. Abbott, executive director, American Institute of Steel Construction; "Welding—a Factor in Industrial Revival," by Willard T. Chevalier, publishing director, *Engineering News-Record* and *Construction Methods*.

Exhibitors' Advisory Unit Formed

A "Members' Advisory Committee" was recently organized by the board of directors of the Exhibitors Committee Industrial and Power Shows, Inc., to function as a consulting group in connection with show problems of members. Large in membership, this committee will seldom if ever act as a whole. Upon a request for assistance, the president will designate those committee members best qualified to handle the particular request. The plan offers flexibility and quick answers given by corporation representatives with many years of show experience.

Among the corporations whose representatives will serve on this committee are: American Brass Co., American Car & Foundry Co., Babcock & Wilcox Co., Consolidated Ashcroft Hancock Co., Consolidated Gas Co. of N. Y., Crane Co., General Electric Co., International Nickel Co., Jenkins Bros., Johns-Manville Corporation, Link-Belt Co., National Tube Co., National Aluminate Corporation, S K F Industries, Inc., The Texas Co., Timken Roller Bearing Co., Walworth Co., and Westinghouse Electric & Mfg. Co.

American Cars Gain Abroad

According to the National Automobile Chamber of Commerce, sales of its members during the first quarter of 1933 were 19 per cent above those of last year. Heaviest gains were registered in Argentine, Sweden, Egypt, Brazil, New Zealand and the Philippine Islands. Anticipation of a policy of greater international cooperation is given as a reason for this increased activity. Foreign motor dealers are already discounting expected improvements in world economic conditions.

Stainless Steel Topic of Joint Meeting

An exhibit and a symposium on stainless steel will be held in the Engineering Societies Building, New York, N. Y., on April 26. The joint sponsors of this meeting are the A.S.M.E., A.I.M.M.E., A.W.S., A.S.S.T., and the Electro-Chemical Society. The topics and speakers are as follows: "Development of Stainless Steel and Present State of the Art," by Marcus A. Grossman, research engineer, Illinois Steel Co.; "Heat-Resisting Steels," by Frederick M. Becket, president, A.I.M.M.E., and president, Union Carbide & Carbon Research Laboratories; "Uses and Applications of Stainless Steel," by Walter M. Mitchell, metallurgical engineer, United States Steel Corporation. In addition, motion pictures will be shown on the construction and operation of the Budd rail car. George H. Charles, secretary, American Iron & Steel Institute, will preside.

• INDUSTRIAL REVIEW •

Mixed feelings of hope and apprehension are reflected in continued hesitation in the metalworking industry. Hope is derived from the belief that any change will be an improvement over the doldrums which have so long prevailed, that rising prices will unleash buying which eventually will extend to equipment and that even regulation of working hours may have the saving grace of improving the demand for more efficient machinery. Apprehension is based on the ultimate effect of dollar devaluation and the prospect of unprecedented industrial regulation by government bureaus.

Even now there are early indications that machinery makers will profit by the inflationary stimulus, but definite action is still lacking. New York reports no change, buyers using the general uncertainty as an excuse for delaying purchases. Boston has felt increases in employment, in small repair orders and in inquiries for larger equipment.

Pittsburgh, already buoyed by increased steel mill activity, looks for a still greater rise. Electrical sales also add to the optimism. Nut and bolt orders have risen in Cleveland with machinery and parts orders in prospect. In Cincinnati, inquiries, particularly from smaller shops, are active, and there are indications that some of the larger deals long hanging fire may now materialize.

Detroit, enjoying a revival of automobile demand, looks for even greater activity from the $130,000,000 to be released shortly by closed banks. A few new orders and increased employment, some of which are directly traceable to beer, are reported in Chicago. In Indianapolis there is a feeling that the peak of unemployment has been reached.

Substantial inquiries cheer Milwaukee which looks for orders within the next month or two. General improvement in business is felt in St. Louis, but as yet this has not hit the machinery trade.

British Manufacturers Pool Orders

Five large cutlery manufacturers of Sheffield, England, are grouping their orders for scissors. As a means of reducing production costs, the number of pairs needed to fill all orders are made at one plant, according to a Commerce Department report. Orders for all cutlery other than scissors will be filled by the individual plants booking them.

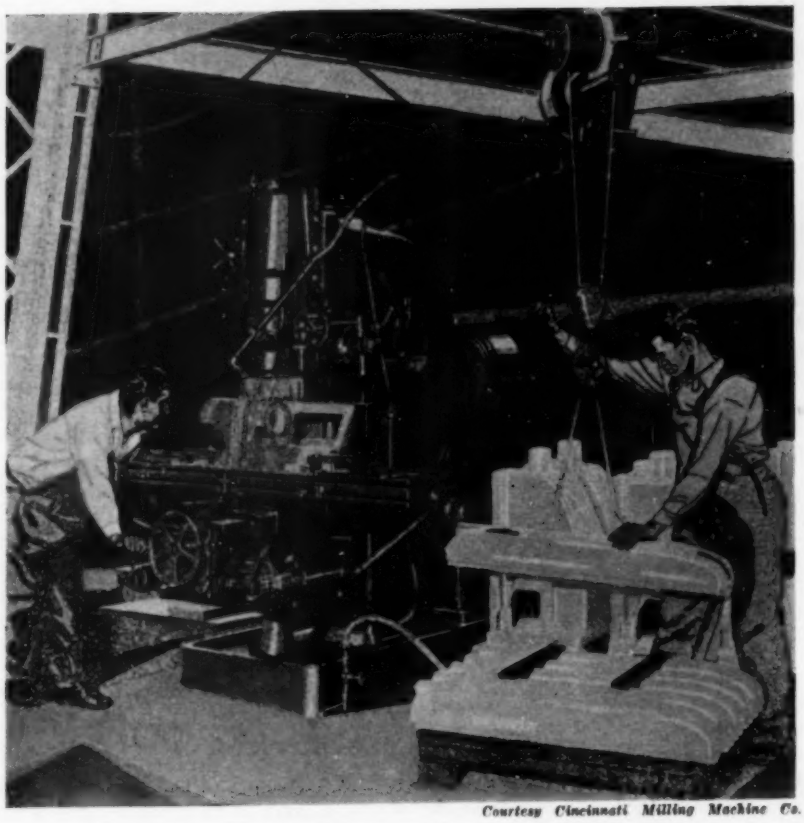
State College to Hold Lubrication Meeting

Under the joint auspices of the Pennsylvania State College and the Lubrication Engineering Committee of the A.S.M.E., the second national lubricating engineering meeting is to be held at State College, Pa., on May 25-26. Among the papers to be presented are: "Practical Interpretation of Lubricant Specifications," by J. G. O'NEILL, U. S. Engineering Experiment Station, Annapolis, Md.; "Machine Design for Lubrication," by E. M. BARBER and C. C. DAVENPORT, Pennsylvania State College; "Roll Neck Lubrication," by W. D. HUDSON, Hudson Corporation; "Lubricant Viscosity Standardization for Industrial Equipment," by Dr. A. E. BECKER, Standard Oil Development Co.; "Application of External Pressure Lubricants to the Lubrication of Industrial Machinery," by DR. O. C. BRIDGEMAN, Bureau of Standards; "Problems of Lubricating Heavy Duty Gears," by AUSTIN KUHNS, Farrell Birmingham Co.; "Wire-Rope Lubrication," by A. J. MORGAN, Roebling & Sons; "Discussion on Friction of Wire Ropes in Sheaves," by L. M. TICHVINSKY, Westinghouse Electric & Mfg. Co.; "Some Practical Factors Affecting Design and Operation of Bearings for Large Rotating Apparatus," by T. W. GORDON, General Electric Co.

Railroads Make Safety Record

Only one passenger lost his life in train accidents in 1932, according to reports just filed with the Interstate Commerce Commission. This represents 480,000,000 passengers for each fatality, the best average ever attained in this country. In 1931 there was one fatality for every 149,807,000 passengers.

The number of passengers injured in train accidents in 1932 was also a new low record, 410 having been reported as compared to 493 in 1931.



Courtesy Cincinnati Milling Machine Co.

Decorating Cincinnati's new railway terminal are a number of mosaics depicting the city's various industries. That shown above is appropriately entitled "Machine Tools" in token of Cincinnati's world leadership in their design and manufacture

Exports of Machinery During March, 1933

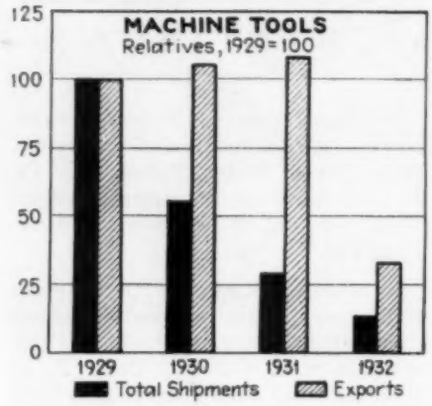
	Mar., 1933	Feb., 1933	Mar., 1932
Electrical machinery	$2,732,276	$2,461,271	$4,654,495
Power generating machinery (except electric and automotive)	263,648	750,210	422,498
Construction machinery	174,404	237,176	477,577
Mining, well and pumping equipment	955,292	822,606	940,523
Power driven metal-working machinery	681,914	750,210	838,608
Other metal-working machinery	99,946	100,572	215,313
Textile machinery	302,274	281,888	484,093

Exports of Metal-Working Machinery During March, 1933

	Mar., 1933	Feb., 1933	Mar., 1932
Engine lathes	$33,570	$88,101	$46,385
Turret lathes	758	22,813	7,491
Other lathes	9,912	9,693	11,474
Vertical boring mills	8,578	24,165	13,262
Thread cutting and automatic screw machines	41,723	30,101	22,354
Knee and column type milling machines	37,020	33,610	23,279
Other milling machines	75,104	17,768	42,171
Gear-cutting machines	64,538	19,046	31,299
Vertical drilling machines	2,204	9,184	14,062
Radical drilling machines			
Other drilling machines	10,652	6,065	46,079
Planers and shapers	2,150	2,242	16,425
Surface grinding machines	15,146	24,123	13,595
External grinding machines	3,474	64,701	60,046
Internal grinding machines	11,071	29,106	4,735
Tool grinding, cutter grinding and universal grinding machines	11,737	24,213	18,256
Other metal grinding machines	17,611	28,737	46,663
Sheet and plate metal working machines	93,191	83,762	46,316
Forging machinery	54,357	9,041	110,093
Rolling mill machinery	4,052	1,255	28,494
Foundry and molding equipment	15,737	51,315	38,021
Other power driven metal-working machinery and parts	169,330	175,349	208,106

Other Metal-Working Machinery

Pneumatic portable tools	$13,382	$14,772	$49,662
Other portable hand operated machines and parts	23,393	32,106	44,386
Chucks for machine tools	2,793	2,646	3,167
Machine operated pipe and thread cutters, stocks, dies, taps and other machine operated cutting tools	30,609	33,912	68,591
Other metal-working machine tools	27,769	17,856	49,507



1932 Machine Tool Exports Drop Less Than Domestic Demand

A chart prepared by the Standard Statistics Co. gives a comparison between the decline of domestic and foreign shipments of machine tools during the past four years. With both indexes for 1929 fixed at 100, the far greater curtailment of domestic business is revealed. Since total shipments include both domestic and export figures, the actual decline in domestic demand is even greater than that shown by the black line.

It is pointed out, however, that deterioration of plant equipment has far outstripped replacements and that design improvement has continued. Thus both from physical and technical viewpoints a large volume of mechanical replacement demand has accumulated.

Russia Reorganizes Standards Control

Responsibility for the formulation of standards has been shifted from a central organization of the Soviet Union to the various industries that use standards, according to an article in *Industrial Standardization* for April, based on a report by A. K. Gastev, new chairman of the All-Russian Committee on Standardization. Less emphasis will be placed on political slogans and more on fundamental research.

The new set-up brings the standard-making practices of the Soviet Union into close resemblance with those of the United States and other countries having national standardizing bodies. Instead of itself formulating standards, the All-Russian Committee will engage the support of research organizations and exercise a guiding influence on the making and enforcing of standards.

Special emphasis will be placed on standards for machine construction, metallurgy, and fuels.

Tractor Exports Shift

Because of unsettled conditions, foreign markets for American tractors during 1932 were decidedly shuffled. According to the Commerce Department's Agricultural Equipment division, several leading buyers of the previous year materially reduced their purchases.

Outstanding was Russia which purchased no tractors in this country during 1932 but in the preceding year led all others by purchasing 23,442 units. France, second to Russia in 1931, led all other nations last year by buying 429 units here. In 1931, France purchased 1,035 units from the United States.

The United Kingdom, fourth in 1931 with 769 tractors, moved into second place with 411 bought in 1932. Canada, third in 1931 with 1,031 units, ranked fifth last year with imports of 103 U. S. machines. The Philippine Islands, far down the list of 1931 customers with 101 tractors, advanced to third place in 1932 when 314 units were purchased. Palestine took 77 tractors in 1932 compared with 15 in 1931.

Bolt Standard Approved

Approved by the American Standards Association as B18.2-1933 is a revision of the American Tentative Standard for Wrench-Head Bolts and Nuts and Wrench Openings (B18b-1927). This revision differs from the 1927 edition mainly in that the tables for "heavy" bolts and nuts have been added to the original smaller "regular" series. Manufacturers of valves and fittings and users of pipe lines requested the addition of the heavy series in connection with the relatively large clearance that must be left between the bolt shank and the hole in making flanged pipe connections.

•BUSINESS ITEMS•

Paul F. Hermann Co., 1910 Beechwood Blvd., Pittsburgh, Pa., now represents the Federal Products Corp., Providence, R. I., for precision dial indicators and gages. The company also represents the O. K. Tool Co. and Thomas Prosser & Son, American distributor for Widia tungsten-carbide tools.

Schols Tool & Machine Co., 321 Lake Michigan Drive, Grand Rapids, Mich., has secured by purchase from the estate of W. D. Rearwin, all patents, patterns, machines, parts and good will pertaining to the Rearwin patented sawing and filing machine and will continue its manufacture.

C. H. Reynolds

The Sheffield Machine & Tool Co., precision gage manufacturer, Dayton, Ohio, has been acquired by the interests identified with City Machine & Tool Works, Dayton. C. H. Reynolds, Detroit, associated for some time with both organizations, becomes president of Sheffield. O. M. Poock, president of City Machine & Tool Works, becomes treasurer, while Louis Poock, general manager of City Machine & Tool Works, becomes vice-president and general manager of Sheffield.

A modern plant has been opened by Synthetic Moulded Products, Inc., at Stonington, Conn., to do custom molding. Several well-known molding materials will be used. Production and management of the plant will be under direction of O. W. Greene, Jr., president, whose experience in plastic engineering includes several years in charge of the department of design and development, Pittsfield works, General Electric Co.

William Laidlaw, Inc., Belmont, N. Y., makers of metal-cutting bandsaws, has been purchased by Leon G. Rogers of Cleveland, and Fred Winterhalter, a former employee. Officers will be: Mr. Rogers, president; Mr. Winterhalter, vice-president and general manager; and Edward N. Conrad, secretary.

Pack-Morin, Inc., 261 Fifth Ave., New York, N. Y., has been organized by Charles Pack, formerly vice-president and general production manager of Doehler Die Casting Co., and Louis H. Morin, a specialist in design of automatic machinery, to render an engineering service covering plant management to the chemical, metallurgical and mechanical industries and to specialize in the design of automatic machinery and of machines for casting non-ferrous metals under pressure.

The Seneca Falls Machine Co., Seneca Falls, N. Y., has appointed the Cadillac Machinery Co., Fisher Bldg., Detroit, as its exclusive representative in the Detroit district for the sale of "Lo-Swing" and "Short-Cut" lathes and automatic loading devices. W. H. NETTLE, formerly western sales manager for Seneca Falls Machine Co., is now connected with the Cadillac Machinery Co., at Detroit.

Delaware Steel Service, Inc., Philadelphia, has been organized by G. F. WILSON, GUSTAF PETERSON and S. B. MATHEWS, recently members of the Ludlum Steel Co., Philadelphia district organization, and will carry lines of Ludlum products including tool and special alloy steels, Nevastain stainless steel, and Nitralloy.

• PERSONALS •

NEIL C. HURLEY was elected president of the Independent Pneumatic Tool Co., Chicago, succeeding RALPH S. COOPER, who has been named vice-president in charge of Eastern operations with headquarters in New York. FRANK B. HAMERLY was elected vice-president in charge of the factory at Aurora, Ill., F. W. BUCHANAN was named secretary and EDWARD G. GUSTAFSON, treasurer.

WALTER F. BROWN of Toledo, former postmaster general, was recently elected president of the Cleveland Automatic Machine Co., to succeed the late A. F. GARFORD. Mr. Brown was formerly a vice-president and a director. HERBERT E. NUNN was elected vice-president in charge of sales. A. L. PATRICK was re-elected treasurer and DAVID L. JOHNSON, secretary.

FRED B. JACOBS is now general sales and advertising manager of The Cleveland Container Co., Abrasive Division, Cleveland, Ohio, manufacturer of abrasive sleeves and expanding polishing wheels. Mr. Jacobs has been connected with the abrasive industry for the past twenty-five years and until 1932 was editor of "Abrasive Industry." He has written several books on grinding during recent years.

MARK J. LACEY, of New Britain, Conn., has succeeded GEORGE S. CASE as president of Peck, Stow & Wilcox, Southington, Conn. Mr. Lacey is also general manager.

B. L. DEMPSTER was recently elected president and general manager of Dempster Mill Mfg. Co., Beatrice, Neb., manufacturer of agricultural implements, to succeed C. B. DEMPSTER, deceased.

RUDOLPH E. HELLMUND has been made chief engineer of the Westinghouse Electric & Manufacturing Co., Pittsburgh. The office had not been filled since the death of B. G. LAMME in 1924. Mr. Hellmund joined the Westinghouse company in 1907, and

since 1921 has been engineering supervisor of development. H. W. COPE, formerly assistant director of engineering, has been made assistant to the vice-president responsible for coordination of certain headquarters engineering departments and district engineering offices.

D. H. LOCKE has been made vice-president and general manager of manufacturing of the Dominion Radiator & Boiler Co., Ltd., Toronto, the Canadian division of American Radiator & Standard Sanitary Corp. These duties are in addition to similar positions with American Radiator Co.

B. A. VAIL, is now factory manager at the South Bend plant of Rockne Motors Corp. Previously, he was in charge of production at the Detroit plant, but was transferred when all manufacturing activities were moved to South Bend.

• OBITUARIES •

HERMAN E. FRENTZEL, for more than 20 years chief mechanic, Falk Corp., Milwaukee, died April 12.

A. W. HOPKINS, 49, formerly sales manager of the National Acme Co., Cleveland, died recently. Four years ago, Mr. Hopkins became associated with the Allied Products Co.

HENRY B. NEWHALL, president of the H. B. Newhall Corp., Garwood, N. J., hardware manufacturers, died April 18.

EDWARD E. ZIEGLER, president of the Earl Gear & Machinery Co., Philadelphia, Pa., died recently at the age of 66.

• MEETINGS •

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Annual meeting, May 4-6. Penn Lincoln Hotel, Wilkinsburg, Pa. J. S. MCQUISTON, managing secretary, First National Bank Bldg., Wilkinsburg, Pa.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Second national lubrication engineering meeting. May 25-26. Pennsylvania State College. PROF. F. G. HECHLER, chairman, Pennsylvania State College, State College, Pa.

AMERICAN SUPPLY & MACHINERY MANUFACTURERS ASSOCIATION. Annual meeting. May 8-11. Louisville, Ky. R. KENNEDY HANSON, secretary-manager, Clark Bldg., Pittsburgh, Pa.

AMERICA WELDING SOCIETY. Annual meeting. April 27-28. New York, N. Y. MISS M. M. KELLY, secretary, 29 West 39th St., New York, N. Y.

CASE SCHOOL OF APPLIED SCIENCE AND THE CLEVELAND ENGINEERING SOCIETY. Joint conference on "Re-Engineering for Economical Manufacture." May 10-12. Case School of Applied Science, Cleveland, Ohio. PROF. E. S. AULT, chairman.

NATIONAL FOREIGN TRADE COUNCIL. Twentieth national foreign trade convention. April 26-28. Hotel William Penn, Pittsburgh, Pa. GARDINER L. HARDING, secretary, India House, Hanover Square, New York, N. Y.

Meetings During Engineering Week Chicago World's Fair

AMERICAN FOUNDRYMEN'S ASSOCIATION. Annual convention and foundry and industrial exposition. June 20-23. Stevens Hotel, Chicago. C. E. HOYT, executive secretary, 222 West Adams St., Chicago, Ill.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Semi-annual meeting. June 25-30. Stevens Hotel, Chicago. CALVIN W. RICE, secretary, 29 West 39th St., New York, N. Y.

AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting. June 26-30. Stevens Hotel, Chicago, C. L. WARWICK, secretary, 1315 Spruce St., Philadelphia, Pa.

MIDWEST ENGINEERING & POWER EXPOSITION. June 25-30. Coliseum, Chicago. Headquarters, 308 West Washington St., Chicago, Ill.

SOCIETY OF INDUSTRIAL ENGINEERS. Annual meeting. June 27-30. Stevens Hotel, Chicago. George C. Dent, secretary, 205 West Wacker Drive, Chicago, Ill.

THE ROUND TABLE

Follow the Leader

"Say Ed, what are you paying good mechanics at the shop?"

"Well, let's see. I've had four cuts of ten per cent each, and I think the cuts affected eevryone alike. Figure four tens off the old rate, and you'll have what they actually get. You're paying the old rate, aren't you Al?"

"No, we are not. We're paying what other shops pay."

"But why should you? You justified your new shop by the fact that you had more business than you could take care of in the old one. You slicked up the new place and bought machinery because you were getting good prices for your product. What more do you need to justify your paying good wages?"

"It isn't a question of how much business we've got or what prices we receive. It's a question of what other shops, in town, pay."

"But why should you consult them? Why not pay the old rate as an example to other shops?"

"For two reasons, Ed. In the first place I believe the old rate was too high. It was out of proportion to the service rendered. Secondly, for me to pay more than other shops would demoralize labor in the whole district."

"You don't have to broadcast it."

"How will it be an example to other shops, Ed, if it's not known? You couldn't keep it quiet. My men would brag of it, and every other mechanic and near mechanic in the whole district would be sore. You have to look at things a little differently when you're the head of a concern. A foreman has lots of troubles, but he can be thankful that he has only to carry out policies, instead of framing them."

"It takes a superior intellect to formulate policies, I expect, and you acquire that superior intellect by being a partner instead of a mere foreman."

"Sarcasm doesn't become you Ed. It doesn't take any more intelligence to plan a policy than it does to plan production, but there are more factors involved. If the rate we paid affected only our own shop, we could settle the question in a short time. But just as a foreman has to consider the feelings of his men in enforcing an order, so an owner has to consider the ideas and prejudices of other owners who are affected by his actions."

"Yeah, maybe, but did it ever strike you that some one or other of the manufacturers in a district has to be a leader? Things are picking up now and someone has to be the first to raise wages. Why not you? In fact you wouldn't really be raising them. You'd merely be setting them for a new enterprise. What did you mean by saying that the old rates weren't justified?"

"Maybe I'd better qualify that statement a little, Ed. What I had in mind was the pseudo-mechanics, and the plasterers, pipe-fitters, brick layers and similar one-tool trades. A good toolmaker and a real mechanic have never been paid more than they're worth."

"Well, why not put it on that basis? Employ only first class mechanics and pay them first class rates?"

Can a small shop set a precedent for higher wage rates? Is Al justified in following the policies of other shops?

Discussion

Production Control

My idea of an ideal production control system in a shop like Al's and Mason's is nothing more than a close watch on unfilled orders, a consistent day-by-day decision, between Al and Mason, as to the sequence in which these orders shall be given precedence, and a simple listing of them on a shop blackboard so that none shall depart from their proper order.

There are, of course, many other angles to production control. In fact, it has as many aspects as a centipede has legs. Experience soon teaches that there is such a thing as economic lot sizes and that it will not pay continually to set-up and tear down machine settings on small orders. It will soon be apparent in any plant that certain of the men are best adapted and suited to the performing of certain operations—this again has an effect upon efficient production methods. But there is such a thing as balance in production, which is not a whit less important than dynamic balance in a fast revolving part. This has to do with keeping all of the force busy at all times and will allow us to pursue the ideal of "the right man on the right job" just so far, and no farther, before we again encounter that stern law of diminishing returns.

—John E. Hyler.

Renovizing

Let us suppose that Al is manufacturing a high grade machine with several high-speed bearings, sliding members, cams and levers and of compact assembly. Some of the parts are plated, some are lacquered and others are painted.

If Al moved into the new plant before it was put in condition, it is possible that the workmen would produce work of inferior quality because of insufficient lighting which would later add extra cost in assembling.

Painting side walls, ceilings, and laying new floors would fill the air in the room with particles of dirt and loose material. This would settle in moving parts of the machines during assembly, spoil the plating and lacquering solutions, and make painting of machines impossible.

Machines built under such plant conditions would not give satisfactory performance. This would bring complaints from customers and loss of business. In the end this would cost several times more than the first additional expense required to make suitable plant conditions.

It is evident that Al does not actually have more orders than can be handled with his present equipment. It would therefore be unwise for him to show haste in the purchase of extra equipment. —Robert R. Cornell, *Gorham Company.*

Al is right in feeling that the fixing up of the new plant ought to be done before moving in. The saving made by using better lighting and the decrease in accidents on the improved floors will soon provide ample return on the investment. Such savings will be tangible. The other important but intangible savings will come with improved products through improved working conditions.

Ed feels that all the things Al wants to spend money for will need more attention in the future. That may be true, but meanwhile they will have given real service for the money originally spent on them. The proper time to work out problems of lighting and flooring in a new plant is during the time the old one can still serve. —Fred Bennett, *Standard Products Company.*

Ed seems to have the best of the argument this time.

Al has now two shops for which he is paying rent while, in a period of depression, he has not enough work in sight to crowd the older and smaller one. He had better watch his step.

If he were spending only his own money, he would probably be much more careful than he is with other people's money. His treatment of Mason sounds bad and makes him appear somewhat like an arrogant bully who must have his own way without considering the feelings or opinions of others, who may have better judgment than he. He may be all right to push work along and get output, but he needs the restraining power of a person more capable to decide what the proper action shall be. He is typical of too many headstrong managers who get out of hand and smash the works. In his own estimation, what he knows, counts; what others know, does not count.

He accuses Ed of jumping to details while all his own present plans show that he himself is fussing with nothing else. The only conceivable advantage of his present attitude is that the savings he may effect by doing necessary work in the new shop while it is empty may be greater than the cost of continuing to pay rent for the old shop; but that does not appear likely.

—L. Brown.

Another New Model

Ed is right. There should be a decent interval between closing out the old model and issuing the new. Otherwise, Al's concern is going to lose the respect and future business of those customers who purchased the old model while the new design was an accomplished fact.

If it were merely a question of redesigning for sales effect, without increasing efficiency, Mr. Recent Buyer would have little reason to feel ill-used. But when redesign incorporates radical changes, such as lessened power consumption, lower maintenance cost, and —unkindest cut of all—lower prices, Mr. R. B. is going to say and do something about it.

What Al should have done—if he really felt he must "rush the market" with his new design—would have been to adopt the straight-forward plan of asking prospective customers to hold off the old model until the new design was in production. If the prospect really had to have a compressor right away, then an old model could be sold, subject to exchange for a new model, when such was possible, on terms favorable to all concerned.

By so doing, his position would have been ethically sound in every way, and the concern's reputation materially enhanced. —Robert S. Alexander.

High Finance

Investing in an enterprise which is based purely on anticipated earnings is rather a risky venture. However, if one does not take some chances, it is doubtful whether he will ever obtain his share of life's material riches.

To my way of thinking, Ed should invest in this new corporation, providing he can afford to incur a loss should the concern find itself in an adverse financial situation. He must not be carried away with those flowery promises of Al's but be thoughtful of the fact that in the ultimate he is staking his money on the chance that it may or may not bring a profitable return on the investment. If Ed, on the other hand, sees the idea as a get-rich-quick proposition, he is badly mistaken and should not make any pretense of being interested.

Many of the largest corporations of today were started from modest beginnings, and I do not see why Ed is not justified in identifying himself with Al and Mason. If they are real business men and their designs have been carefully worked out, there is no reason why they should not eventually be leaders in their particular field.

—Harold L. Wynn, *Executive Engineer, Pacific Electric Manufacturing Corporation.*

Larger Quarters

It seems a bit odd for anyone to be proposing expansion of any manufacturing business at a time when almost everyone is proposing "planned production". If our ills are caused by underconsumption which is in turn a revulsion from over-production we certainly ought to pull in our horns.

There are those that still claim that it is better for one man to have ten dollars a week than for two men to have five dollars each. These men overlook the fact that the two five-dollar men will have to put all their money into circulation while the one ten-dollar man will hoard a little of his, regardless of the number and quality of the laws passed to the contrary.

Of course if this man has a "sure tip" that there will be a major war in the next few months, he had best quietly get ready for it. He may hope that Japan and China will buy millions of munitions. My own expectation is that China will gradually withdraw, losing a few men each day, until finally the Japs get so deep into China that we will see ads in our daily papers, "Lost: reward offered, one Japanese army." As for Europe, there is more hope of a man-sized war; but what will they use for money with which to buy munitions here? —E. H. Fish.

American Machinist
REFERENCE BOOK SHEET

Determining Production Rate of Centerless Grinding—Through-Feed Method

THE maximum rate of production in linear inches per hour obtainable from a centerless grinder operating on the through-feed method depends on the power of the driving motor, the rigidity of the machine and the work support blade, and the capacity of the grinding wheel. For a specific job, the roundness, straightness and hardness of the work, as well as the finish and accuracy desired, determine whether the maximum linear traverse may be used.

The first factor to be considered in determining the maximum linear traverse speed is the depth of cut. The desired finish determines the depth of cut, which for average conditions is 0.0005 to 0.001 in. for a good finish, 0.001 to 0.0025 in. for a commercial finish, and 0.0025 to 0.10 in. for a rough finish.

The second factor is the capacity of the wheel to remove metal. This depends on the available power, the finish desired and the suitability of the wheel. The table (next page) lists the capacities of the most suitable wheel with reference to the horsepower applied and the finish desired. These capacities are based on wheels available in 1932.

With the rate of stock removal, the depth of cut and the diameter of work known, the maximum linear traverse speed is calculated from the formula:

$$L = \frac{60 \times V}{3.14 \times d \times T}$$

Where:
L = Linear traverse in inches per hour
V = Volume of metal removed in cubic inches per minute
d = Diameter of the work in inches
T = Depth of cut in inches

Knowing the maximum linear traverse speed, the two adjustments of the machine for securing this speed (the speed and angle of inclination of the regulating wheel) are readily obtainable. The surface speed of the regulating wheel is the same as the surface speed of the work. Hence, a speed for the regulating wheel must be selected that will give a surface speed within the limits of good grinding practice; that is, from 20 to 60 ft. per min., depending on the material and the desired finish. With the surface speed fixed and the diameter of the regulating wheel known, the speed of the regulating wheel is:

$$N = \frac{12 \times S}{3.14 \times D}$$

Where:
N = Number of revolutions per minute
S = Surface speed of the work in feet per minute
D = Diameter of the regulating wheel in inches

The angle of inclination of the regulating wheel is calculated from the formula:

$$\sin A = \frac{L}{188.4 \times D \times N}$$

Where:
$\sin A$ = Sine of the angle of inclination
L = Linear traverse in inches per hour
D = Diameter of the regulating wheel in inches
N = Speed of the regulating wheel in revolutions per minute

Calculating the adjustments of the centerless grinder from the above formulas is simplified by the use of the chart on the next page. An example will serve to illustrate its use. Conditions assumed are:

Diameter of work, 2 in.
Depth of cut, 0.005 in. (rough finish).
Diameter of regulating wheel, 14 in.
Surface speed, 50 ft. per min.
Driving motor, 15 hp.
Rate of stock removal, 1.05 cu.in. per min.
(The grinding wheel was not the most suitable; hence the low rate of stock removal).

On the chart, connect the diameter of the work, 2 in., and the depth of cut, 0.005 in. and note where this line intersects line *OA*. Project a line from the rate of stock removal, 1.05 cu.in., through the point of intersection just found on the line *OA* until an intersection is made on the center vertical line, which shows that the maximum rate of linear traverse is 2,000 in. per hour. Next, connect the traverse speed just determined and the diameter of the regulating wheel, 14 in., and note the intersection on the line *OB*. Since the surface speed is about 50 ft. per min., and the regulating wheel diameter is about 14 in., the speed of the regulating wheel is 14 r.p.m. By projecting a line from the regulating wheel speed, 14 r.p.m.,, through the point of intersection just found on the line *OB*, the angle of inclination is discovered to be 3 deg. Should the surface speed of 50 ft. per min. be too great, a speed of 10 r.p.m. may be substituted and the angle would then be (see chart) 4 deg. for the same linear speed of 2,000 in. per hour.

To determine the diameter at which the regulating wheel speed should be increased, connect the next higher speed available on the machine with the angle of inclination and note the intersection on the line *OB*. Through the new point of intersection draw a line through the linear speed, and the wheel diameter at which the speed is to be changed will be found. As indicated on the chart, the next higher speed available on the machine is 17 r.p.m., and the diameter at which the speed is to be changed is 12 in.

Application of coolant should be at the rate of 2 gal. per min. per applied horsepower.

Contributed by C. W. Hopkins, specialist on centerless grinding, Production Engineering Company

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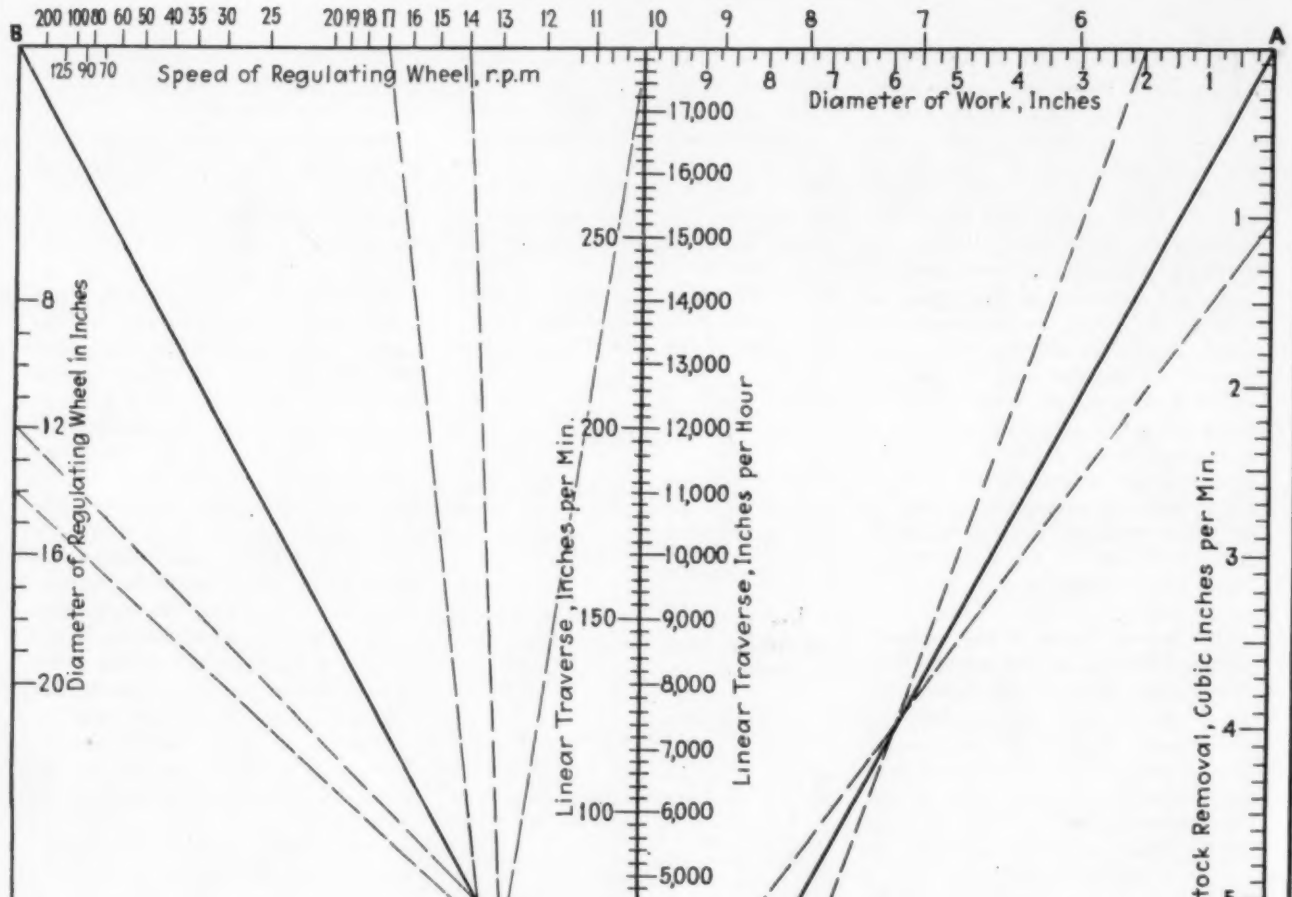
REFERENCE BOOK SHEET

Production Chart for Centerless Grinding—Through-Feed Method



Capacities of Grinding Wheels—Cu. In. Per Min.

Horsepower	5	7½	10	15	20	25	30	35	40	50
Good finish	0.20	0.30	0.40	0.60	0.80	1.00	1.20	1.40	1.60	2.00
Commercial	0.35	0.52	0.70	1.05	1.40	1.75	2.10	2.45	2.80	3.50
Rough finish	0.75	1.12	1.50	2.25	3.00	3.75	4.50	5.25	5.00	7.50

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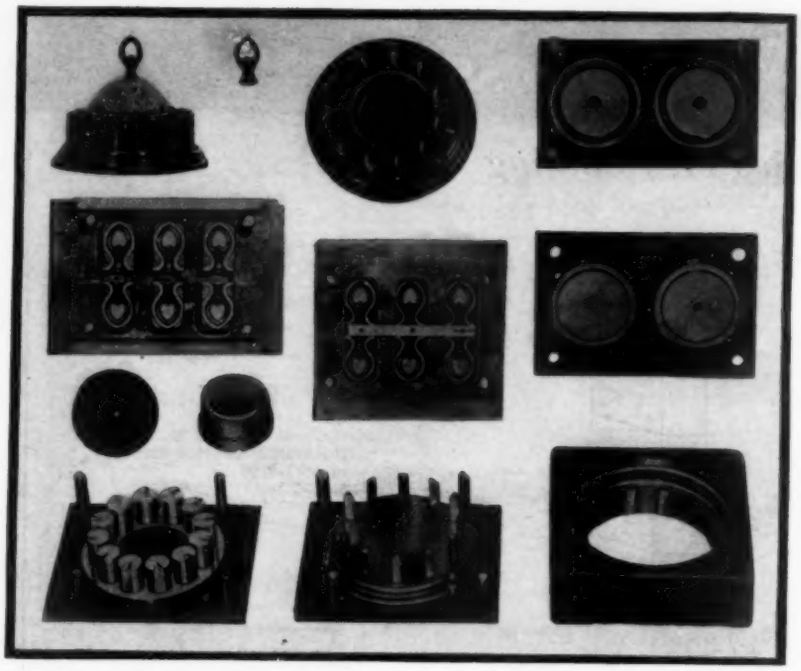


Molds and parts produced from them show the great variety of work that may be made from plastics

Heat-Treatment Of Molds for Plastics

EDWARD F. BACHNER
Chief Engineer, Chicago Molded Products Corporation

PRACTICES relating to the production of satisfactory and efficient molds for plastics have, during the last few years, undergone important changes with the result that better service can be secured from them. Breakage of the molds has been reduced to a low point, quality of the molded products improved and economy of operation increased.

Steel molds are required for molding phenolic and urea base materials because it is necessary to use pressures varying from 2000 to 4000 lb. per square in. and temperatures up to 350 deg. F. Heat-treatment of these molds is, therefore, necessary in order to produce certain definite desirable characteristics in the steel, and must be carried out at equally definite stages of the machining operations.

Of the desired characteristics the most important is improvement of the structure of the soft steel by hardening after the mold has reached the finished stage. This protects the workmanship and shape of the mold cavities against stresses subjected by the molding pressure, and abuse from handling. In other words, the molds must have hard, polished surfaces and be tough enough to resist great pressures.

Until the last few years, oil-hardened tool steel was used almost exclusively. Such steel, when properly heat-trated, produces a mold that is hard throughout its entire structure and has great strength so far as resisting pressure is concerned but this is accompanied by brittleness. Sometimes, also, internal stresses in the body of the mold are set up by oil-hardening. While such molds resist elongation and flexure, they are likely to fracture during the molding operation, usually across a section which renders them unfit for further use.

For these reasons machine steel of low carbon content (approximately 0.20) has been adopted for making molds of this type. This steel has the advantage that an outer shell of great hardness with a soft interior can be produced by means of the pack-hardening process. The hard outer shell may be given a thickness up to $\frac{1}{8}$ in. depending on the construction and requirements, and can resist both wear and pressure. The soft interior has greater tensile strength, is tough and resists fracture.

When molds are made of such low carbon steel, they should first be machined roughly to their final shape and size. This machining sets up internal stresses, varying according to the shape and size of the piece, and unless they are relieved they will cause the mold to warp and distort. To relieve these stresses and normalize the steel, the mold should be heated slowly to approximately 1650 deg. F. and quenched in cold water. It must then be reheated to 1350 deg. in a charcoal box, and allowed to cool slowly in the box.

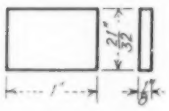
The mold is then ready to be machined to finished size and shape, and all contact surfaces smoothed and polished. The mold sections or cavities should then be imbedded completely in carbonizing compound and be packed and sealed in a steel box so that the gases will be confined. The box of parts is then placed in a hardening furnace at a temperature of 1550 deg. and allowed to remain there from twelve to fifteen hours, depending on the size of the parts and the depth of case hardening required.

After this period the parts are permitted to cool to about 600 deg., reheated to 1450 deg. and finally quenched in oil. They could be quenched in water, but they are more likely to warp or shrink than when quenched in oil.

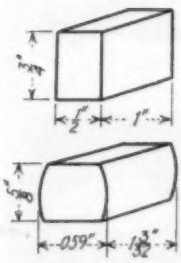
This pack-hardening process produces a hard surface, and if there are any thin sections which the pack hardening has entirely penetrated, it is essential that the temper be drawn to eliminate danger of breaking or chipping at the edges. The structure of the section will govern the degree of temperature to which it should be reheated.

Press Work Pressures

Series IV—*Coining*

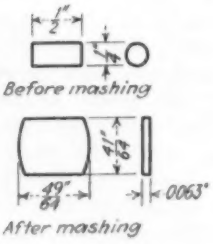


Material--Annealed brass, 1 in. long by 1/8 in. thick
Operation--Reduced to 0.094 in. thickness, length increased to 1-9/16 in.
Pressure--65,000 lb.

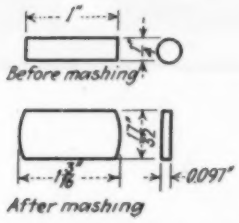


Material--0.50 carbon steel, 1 in. long by 3/4 in. high by 1/2 in. thick
Operation--Reduced to - A. 23/32 in. thick
B. 11/16 in. thick
C. 21/32 in. thick
D. 5/8 in. thick
Pressure--A. 59,600 lb.
B. 76,800 lb.
C. 86,200 lb.
D. 92,600 lb.

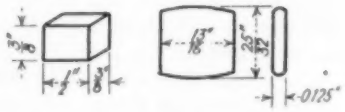
Material--Soft machine steel, 3/16 in. thick
Operation--Reduced to 0.145 in. thickness, diameter increased to 1-9/16 in.
Pressure--34,000 lb.



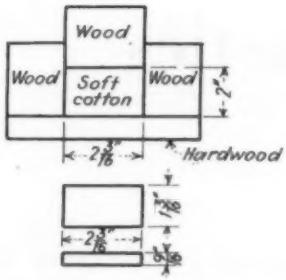
Material--Soft machine steel, 1/2 in. long by 1/4 in. in diameter
Operation--Reduced to 0.063 in. thickness
Pressure--70,000 lb.



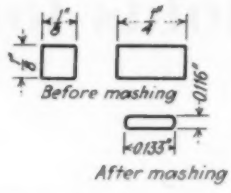
Material--Soft machine steel, 1 in. long by 1/4 in. in diameter
Operation--Reduced to 0.097 thickness
Pressure--75,000 lb.



Material--Iron, 1/2 in. long by 3/8 in. thick
Operation--Reduced to 0.125 in. thickness
Pressure--35 tons

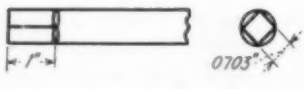


Material--Soft cotton, 2 in. thick
Operation--Dies made of hard wood. Compressed from 2 in. to 3/8 in. thick. Cotton expanded to 9/16 in. when taken from the dies
Pressure--16,000 lb.

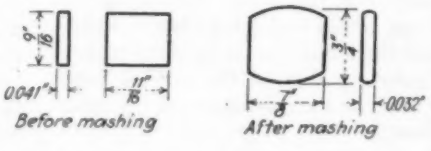


Material--Iron, 1/4 in. long by 1/8 in. thick
Operation--Reduced to 0.116 in. thickness
Pressure--Annealed, 6,400 lb.
Unannealed, 3,400 lb.

Material--Coiled rolled steel, 3/4 in. in diameter by 5/8 in. long
Operation--Reduced from 5/8 in. to 9/32 in. thickness
Pressure--50 tons



Material--Rouni refined iron
Operation--Coin square end
Pressure--50 tons
Flash produced was 1/16 to 3/32 in. wide by 1/64 in. thick
Test made in testing machine



Material--Annealed soft brass, 0.041 in. thick
Operation--Reduced to 0.032 in. thickness
Pressure--50 tons

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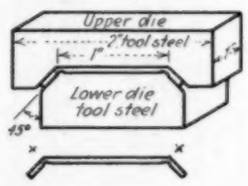
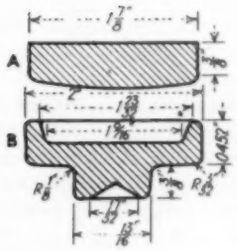
Press Work Pressures

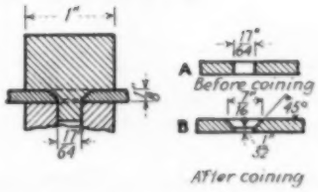
Series IV—*Coining*



Material--Soft brass, 1 in. wide by 0.044 in. thick
Operation--Coin corners x-x sharp
Pressure--10 to 12 tons
Test made in testing machine



Material--Copper - 2 parts
Tin - 1 part
Operation--Piece B coined from piece A
Done red hot at 1,000 deg F.
Pressure--Taxed a 250 - ton press. A 400-ton press should have been used

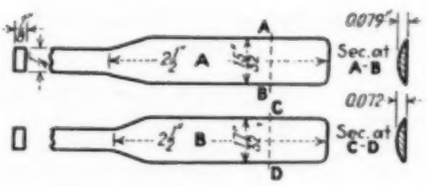


Material--Machine steel, 1/8 in. thick
Operation--Coin piece A to Piece B
Pressure--10 tons
Test made in testing machine

One-half size

Fig. 1 Fig. 2

Material--Soft bronze plate
Pressure--Fig. 1-10 tons
Fig. 2-15 tons
Test made in testing machine



Material-- Machine Steel
Operation--Coin piece A into piece B
Pressure--330 tons

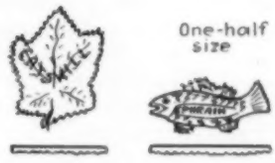


Fig. 1 Fig. 2

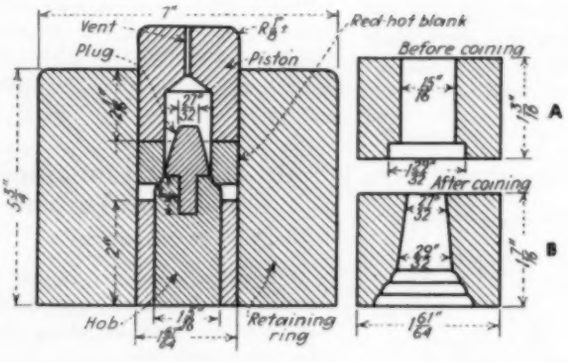
Material--Soft bronze
Pressure--Fig. 1 - 38 tons
Fig. 2 - 30 tons
Test made in testing machine

One-half size

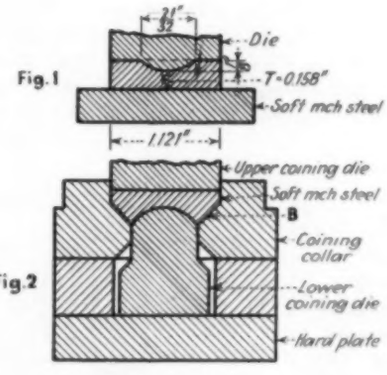
Fig. 1 Fig. 2

Material--Soft bronze
Pressure--Fig. 1-15 tons
Fig. 2-25 tons
Test made in testing machine

Material--Ion Metal similar to aluminum, 0.114 in. thick
Operation--Reduced to 0.063 in. thickness
Pressure--92,000 lb.



Material-- Machine Steel
Operation--Coin red-hot piece A to piece B
Pressure--800 lb. hammer operating on 125-lb. steam pressure. 500 tons applied at last 1/8 in. of fall of hammer



Material--Soft machine steel blank, 5/16 in. thick
Operation--Coin bearing
Pressure--50 tons to coin bevel B, Fig. 2
Note: The upper die, Fig. 2, will not stand up unless a depression is first made in the blank as shown at Fig. 1

Contributed by C. W. LUCAS © *American Machinist*

• IDEAS FROM PRACTICAL MEN

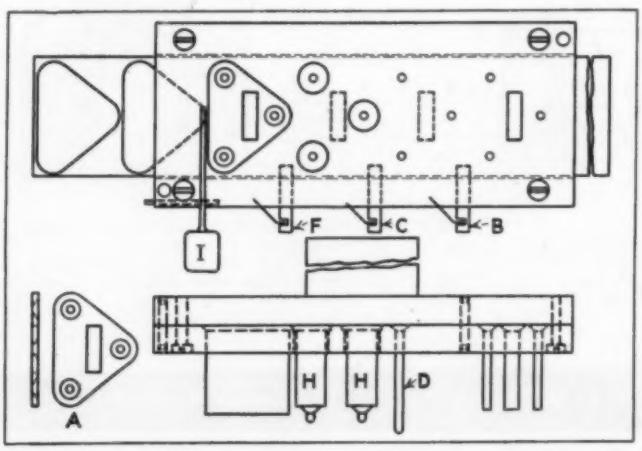
Progressive Tools for Piercing, Countersinking and Blanking

CHARLES KUGLER

We had to make a large quantity of plates such as the one shown at *A* in the illustration. Tools were designed to do the piercing and the countersinking with the same punches, but we had no success with them. I then designed the progressive tools illustrated, of which the essential parts only are shown for the sake of clearness.

The strip stock is fed from right to left, the end being brought into contact with the stop *B*, which was pushed in by hand. At this station the three round holes and the rectangular hole are pierced. Letting go of stop *B*, its spring returns it to its normal position. Stop *C* is then pushed in and the end of the strip is advanced into contact with it. As the ram descends, the pilots *D* enter the two forward round holes and line up the strip, and the second set of holes is pierced at the first station. At the third stroke, the end of the strip is brought into contact with the stop *F* and the three round holes are countersunk by the punches *H*. At this position, the third set of holes is pierced at the first station and the pilots enter the two forward round holes pierced in the second stroke.

The strip is then advanced so that its end is in contact with the jump finger-stop *I*. At this stage the piece is blanked, the preceding operations taking place at the other stations. After the first blanking, one piece is completed at each stroke, the strip being advanced until the stock at the right-hand side of the hole left by blanking is in contact with the jump finger-stop. The three countersinking punches are arranged to float slightly in the punch-holder, so that correct alignment will be maintained.



Piercing, countersinking and blanking in progressive stages instead of with the same tools give results that are much more satisfactory

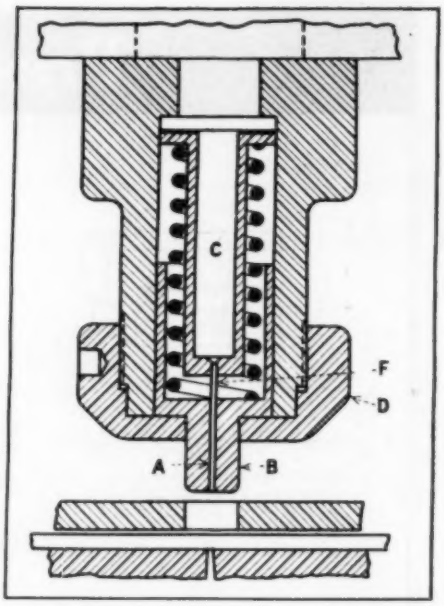
Supporting a Slender Punch

E. F. EBERHARD

When designing press tools having a punch as small as $\frac{1}{32}$ in. in diameter, nearly all tool designers use the well-known method of supporting the punch by a quill to within a distance from the end equal to the thickness of the stock to be pierced. While this method may be all right where the stock to be pierced is thin, I have found that in piercing $\frac{1}{32}$-in. stock with a punch 0.028 in. in diameter, often the punch would break at the unsupported end. This trouble was overcome by employing the method of support shown in the illustration.

The punch *A* is supported at its very tip by the sliding quill *B* until it enters the stock, after which the stock itself serves as a support. It is impossible for the punch to be swerved to one side by hard spots in the stock, hence shearing of the die is prevented and, of course, the hole is pierced with greater accuracy. The punch is held in the holder against the stop *C* by the strong helical spring, which also serves to back up the sliding quill and returns the quill to the position shown as soon as the punch leaves the stock on the upward stroke of the ram. As a matter of fact, the quill does the actual stripping, and more efficiently than would the stripper plate shown, because the stock cannot "whip" or move while the punch is receding.

The holder can be quickly disassembled by removing the nut *D*. In use, no trouble was experienced because of the unsupported part of the punch at *F*, in as much as the remainder is supported at points above and below. In addition to the advantages mentioned, the punch required less grinding than the one formerly used, which was supported in the conventional manner.



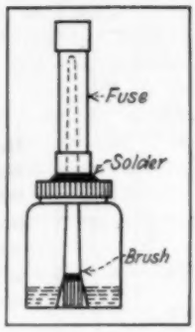
Preventing breakage of a slender punch by using a proper support

An Airtight Container for Paint or Varnish

HOMER COY

It is often necessary to use paint or varnish for touch-up jobs, and it is a nuisance to have to clean the brush after each such job.

An airtight container for both the paint and the brush can be made from a screw-top jar and a blown-out fuse of the cartridge type. A hole the diameter of the inside of the fuse casing is drilled through one of the brass caps and that end is soldered to the screw cap of a jar. A connecting hole is then punched through the cap. When the cap is



Soldering a blown-out fuse to a screw top makes an air-tight container

screwed on the jar, the brush handle sticks up through the inside of the fuse casing. By the use of this device, both the paint and the brush are kept from the air and are ready for use at any time. A rubber grommet will hold the brush off the bottom of the jar.

Forming Tools for Coils

ANDREW BEUSCH

Copper coils for an electrical apparatus, one of which is shown at *A*, were formerly made by beating strips of copper over a form with a raw-hide mallet. Since this method was slow and not altogether satisfactory, the press tools illustrated were designed to speed up production and to improve the quality of the product.

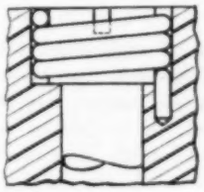
The copper strip is bent step by step into the final shape, two right-angle bends being made at each stroke of the press. In operation, the strip is fed under the clamp *B*, which is operated by a pedal. After the strip has been correctly located, pressure is applied to the clamp and the press is tripped, making the two bends *C* and *D*. The clamp is then released and the strip is turned over and clamped again as indicated in the illustration. As the ram descends, the two bends *F* and *H* are made. These operations are repeated until the entire coil is finished.

The spacing of the coil can be changed in width by substituting for the spacer block *I*, one of a different thickness, and in depth by substituting for the bottom block *K*, one of different height.

Locking Fillister-Head Screws

ERNEST C. ALLEN

A very effective device for locking fillister-head screws is a spring wound small enough to grip the screw head tightly. One end of the spring should be bent at a right angle and inserted in a hole drilled in the bottom of the counter-



Using a coil spring with a tail for locking screws in place. Removal is easy

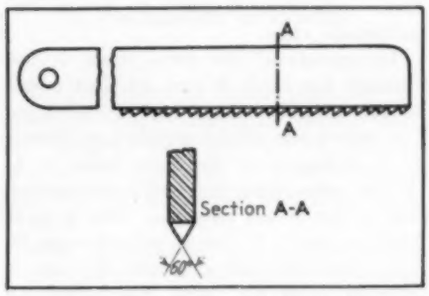
bore. Pressing back the end of the spring at the top of the screw head with a screwdriver, or other tool, will loosen the grip of the spring and permit the screw to be backed out.

A right-hand spring will lock a screw having a right-hand thread, and vice versa. The sketch shows the scheme.

A Practical Thread Cleaner

GLYNN WILLIAMS

One of the most practical thread cleaners I have ever seen was made from 8 in. of a discarded blade of a power hacksaw, the teeth being ground away for about 4 in. to leave a handle. The sides of the remaining teeth were ground to an included angle of 60 deg., as shown in the illustration. If the threads are corroded or are full of dirt, this tool will clean then rapidly. Being ground without clearance on the sides of the teeth, the tool will not cut on the flanks



Grinding a hacksaw blade this way makes a good thread cleaner

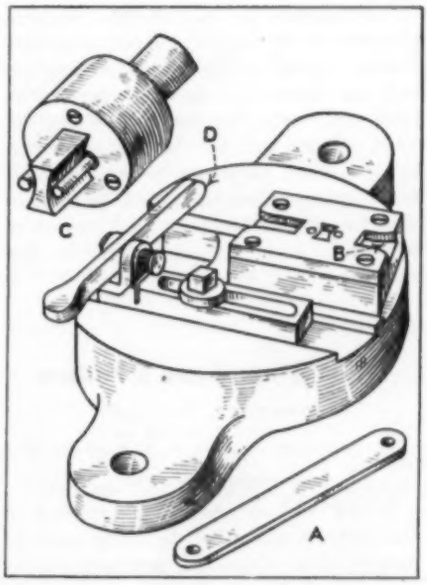
of the threads, but will clean out only what is in front of the teeth.

The tool works better if used with a draw cut. It works faster and is more accurate than a single-pointed tool. It is superior to a saw file, in that it reaches to the bottoms of the threads. The teeth can, of course, be ground flat on the bottoms to suit U.S.S. threads.

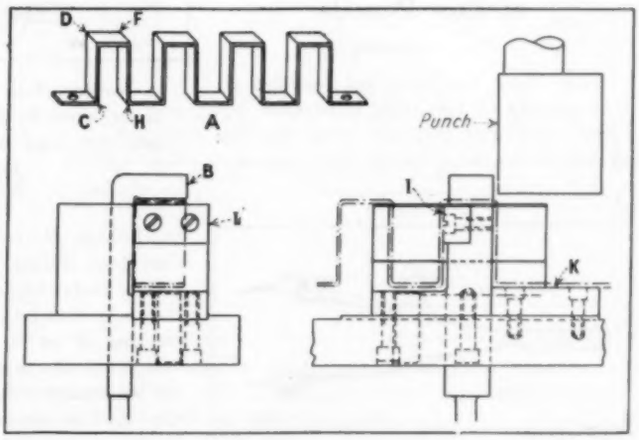
Press Tools for Piercing and Cutting Off

CHARLES H. WILLEY

We have occasion to make bars of different lengths from $\frac{3}{8}$x1-in. strip stock. The bars, one of which is shown at *A* in the illustration, have rounded ends and holes $\frac{7}{16}$ in. from each end for tapping. Tools such as are illustrated are used for the work, and we find them quite rapid in operation, runs being made for three cents per hundred. Since the quantity made at any one time never exceeds a couple of thousand, the



Piercing and cutting off the ends of strip stock at one operation. The ends are rounded at the same time



Press tools for forming rectangular coils in a step-by-step process that secures square corners without stretching the metal. Two bends are made at once

tools were not designed to be in the automatic class.

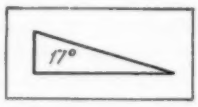
In operation, the strip stock is fed through the guide *B* and the square end of the strip is cut off and rounded by the center one of the punches, as shown at *C* enlarged to the same scale as *A*. At the same time, the end is pierced by one of the round punches. The strip is then advanced to the adjustable stop *D*, and when the ram descends the bar is severed from the strip, the adjoining ends of each being rounded and pierced. Pressing down on the pivoted stop frees the outer end of the bar and permits it to drop through the opening in the die. When the stop is released it is brought back to its normal position by a spring and is ready for the oncoming strip.

From the description, the operation may seem slow, but it is really quite rapid, as shown by the piece price mentioned.

Triangles for Tool Setting

CHARLES WESLOW

Small triangles, such as the one illustrated, are very handy for setting tools at an angle. I have a set of them—I call them "jiblets"—in a rustproof case in my toolkit. They are made of B & S ground tool steel and are of various angles. Each one is 1⅞ in. long on the



Steel triangle that makes it easy to set tools

base, is hardened and ground and has the angle stamped on one side.

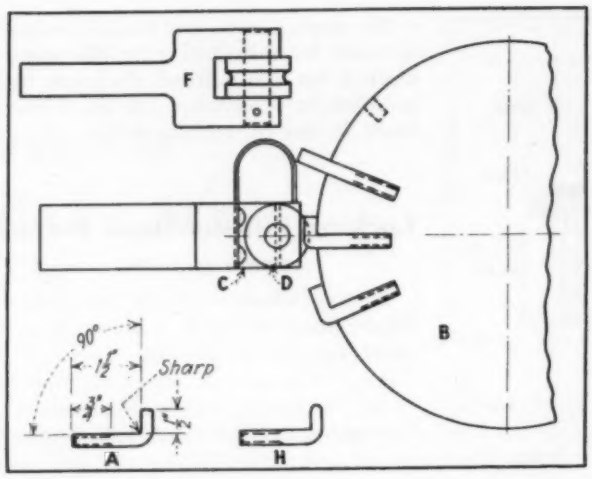
For example: if I have to set a square-nose tool in the shaper at a certain angle, I use a "jiblet" of that angle, resting the base on either the machine vise or the table and setting the tool by the angular edge. Other uses can be found for the "jiblets," and they can be used in confined spaces where it would be impossible to use a protractor. Tool inspectors will find them "second nature" to the sine bar.

Tools That Were a Failure

FORREST L. JOHNSON
Tool Designer
Westinghouse Electric & Manufacturing Company,
Mansfield, Ohio, Plant

Every tool designer has experienced the embarrassment of designing tools to satisfy ideas that are contrary to his own knowledge and experience, usually receiving full blame for the designs when the tools are failures.

A progressive tool-engineering division is at all times open to suggestions for the improvement of designs, but there are laws governing these designs which, when neglected, result in trouble or in complete failure. The tools illustrated were designed for forming the 90-deg. bend on ⅞-in. brass studs, making them into hooks, one of which is shown at *A*. The studs were threaded and cut to length in screw machines.



Here is a method designed for making a 90 deg. bend in small brass studs. These tools were a complete failure. How would you do the job in large lots?

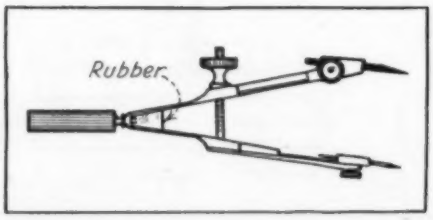
In operation, the studs are placed by hand in holes that are equally spaced around the periphery of the special faceplate *B* which is screwed on the spindle nose of an engine lathe. The forming tool *C* is held in the toolpost of the lathe, its roller *D* having a ⅞-in. groove that fits the studs. The flat, gooseneck spring *F* makes certain that the studs bottom in the holes. Unloading is by gravity. These tools were a complete failure, because the curvature of the faceplate was not taken into consideration and the part, as shown at *H*, would iron out by the pressure required to make the 90-deg. bend.

How would the reader attack the problem of making these hooks in mass quantities as shown at *A*, which is a copy of the engineer's drawing?

Reinforcing the Springs of Bow Pencils

C. A. JOHNSON

After long use, the flat springs on bow pencils of the type illustrated become weak and will not open the legs of the instrument to its full capacity.



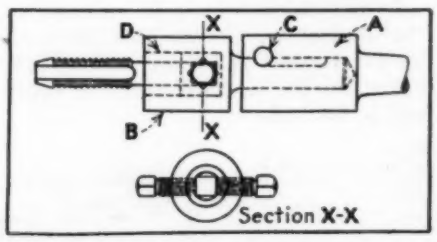
This weakness may be overcome by stretching out the legs and wedging a piece of soft rubber between the springs, as shown. A piece of rubber cut from a pencil eraser will answer the purpose.

A Tap Holder for the Lathe

PETER L. BUDWITZ

Hand taps are often used in the lathe to size partly chased threads, or to start internal threads in alignment with bored holes. The tap is guided by the tailstock center, being held by a dog or a wrench. As the tap is drawn into the hole, the operator has to follow it up by advancing the tailstock spindle by turning the handwheel. Unless he is quick and attends strictly to business, the tap will be drawn off of the center, endangering both the tap and the center.

In the illustration is shown a device for holding taps in the tailstock spindle. It consists of the body *A*, having a shank to fit the taper hole in the spindle; the



A holder that permits hand taps to be used in the lathe and to follow the lead without moving the tailstock

tap-holder *B*, having a flatted shank that is a sliding fit in the central hole in the body; the pin *C*, which is driven into a crosswise hole in the body; the bushing *D* to fit the shank of the tap; and two setscrews for holding the tap by its squared end. Both the pin and the flatted shank of the holder are

hardened. Bushings are made to fit the shanks of taps of various sizes.

In use, neither the tap nor the holder can revolve, the tap being held by the two setscrews bearing on its squared end, and the holder by the pin *C* engaging its flatted shank. As the tap starts to cut it draws the holder forward. Other than advancing the tap for the start, no manipulation of the handwheel on the tailstock is necessary.

Precision Bench Gage for Internal Measurements

WM. C. BETZ
Master Mechanic, Fafnir Bearing Company

For accurately measuring finished bores in commercial articles, a bench gage of the type illustrated will prove its worth.

The end of the gage body is drilled and tapped for the attachment of heads, or plugs, of various diameters, as at *A*, being held in correct location by dowel pins. The heads are so designed that the contact ball of the indicator lever will always contact with the center of the work, laterally, as at *B*. It will be noted that the fulcrum of the lever is as close to the end of the gage body as possible. This is done to keep the lever short so as to avoid undue bending moments. To further reduce stresses, the spring is located about 2 in. from the spindle of the dial indicator and has enough tension only to balance the weight of the lever.

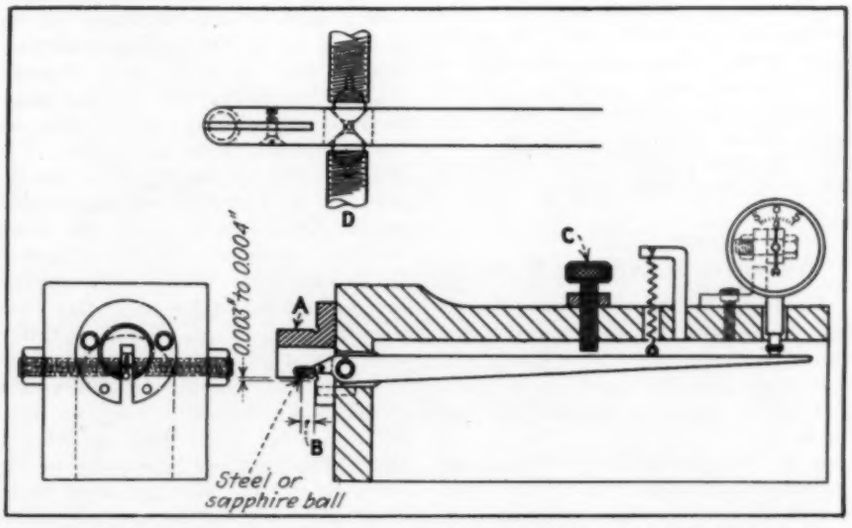
In locating the heads on the end of the gage body, care is taken to have the bottoms about 0.003 in. above the contact ball of the lever when the indicator hand has made half a revolution, thus when the work is gaged, the indicator hand will make nearly a full revolution in indicating the size. For calibration, a ring gage is used and the indicator dial is set to zero. The stop screw *C* is then set so that the lever does not go out of bounds in relation to the bore being measured. To assist in the calibration for different diameters, the dial indicator can be adjusted up or down in its bracket.

Attention is called to the enlarged view of the lever fulcrum at *D*, in which steel balls and hardened, lapped and highly polished female centers are used.

In operation, the work is gaged at two radial points, at one point on the top of the head and the other on the lever contact. The head should fit the bore to be gaged within 0.001 in. minus for each inch of diameter of work to be gaged. The accuracy of gaging, due to this freedom of the work on the head affects the measurement to the extent of about 0.000002 in. only, which in commercial measurement is nil.

To gage a piece of work, it is slipped on the head against the shoulder and a reading is taken on the dial gage. To check the bore for taper, or for bellmouth, auxiliary collars of different widths are slipped on the head to bring the edge of the bore as near to the contact ball on the lever as desired. For taper, it is necessary to gage the work close to each end of the bore and note the readings at each position. For bellmouth, the bore must be gaged at both ends and in the center.

True radial measurements can be taken only if the face of the work is square with the bore and the face of the work is held squarely against the shoulder of the head, or, in gaging for taper or bellmouth, against the face of the auxiliary collar.



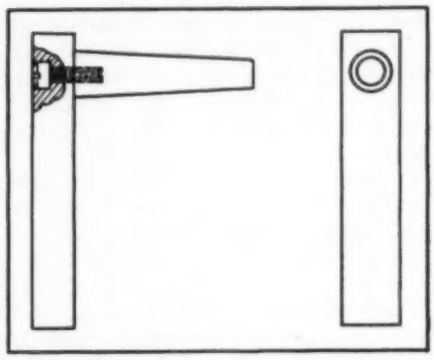
Finished bores of many kinds can be inspected by this bench gage. Steel or sapphire balls can be used. The gage can be adapted for taper, bellmouth or other inspection

A Diemaker's Square

L. KASPER

The conventional angle gage, or so-called diemaker's square, ordinarily used for checking the clearance of dies, is subject to a number of disadvantages that the gage illustrated was designed to overcome.

With the ordinary type of gage having a flat blade, it is possible, by swinging the lower end of the stock toward or away from the user, to slightly alter the position of the edge of the blade in relation to the surface being tested. In fact, there seems to be a tendency to swing the stock of the gage in order to secure a line contact between the work and one corner of the blade edge so that light may pass through where the contact is imperfect. This condition is inherent in all gages having flat blades if the included angle between the blades and the stocks is either greater or less than 90 degrees.



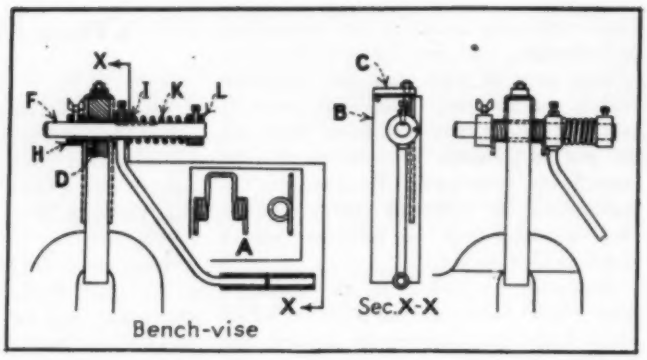
A simple square with a fixed angle. The blade, or plug, can be tapered any amount and in either direction

In a gage of the type illustrated, the angular relationship between the blade and the work does not vary, regardless of whether or not the stock is swung either away from or toward the user. The blade, being round and tapered, always presents line contact with the work, and when it becomes worn in one place it can be rotated to present a new surface. No great skill is required to make such a gage, as it is finished entirely by grinding. The main requirement is to have the end of the blade that bears against the stock at a right angle with its axis.

Fixture for Winding Springs

EMIL WITTMANN

A fixture for winding such springs as the one at *A* is shown in the illustration. It consists of the body *B*, made of cold-rolled steel, the free end of which is held in a vise. The opposite end has a V-



Hand winding fixture for double-ended springs. Coils are wound tightly and the form can be modified

groove for locating the wire and the clamp *C;* the bushing *D,* pressed in the body and having a helical cam-face at each end to lead the wire; the mandrel *F;* the removable collar *H;* the sliding collar *I;* the spring *K;* the stationary collar *L;* and a crank for revolving the mandrel.

In operation, the wire to be wound is clamped in the V-groove and is bent to a U-shape by hand, the body of the fixture being used as a forming block. The mandrel is put through the bushing and is held in place by the removable collar. When the crank is turned, hardened pins in both collars wind the free ends of the wire around the mandrel on both sides of the body. As the winding progresses, the mandrel and the removable collar are forced to the left by the advancing coils, while the sliding collar, to which the crank is attached, is forced to the right against pressure of the spring. These movements insure that the coils will be tightly wound.

To remove the finished spring, the removable collar is taken off, the clamp is loosened, and the mandrel is slid out of the bushing.

SEEN AND HEARD

JOHN R. GODFREY

Deep Hole Drilling

Deep hole drilling has long been a controversial question. Twist drills and gun drills have been tried, together with the use of stationary and revolving work. The fine work done by gun drills, with both work and drill revolving seemed to mark that as the only way to get a really straight hole. For drills seem to have a contrary tendency to "run" when given the opportunity. But as with many other things we may have to revise our idea a bit. For now comes a development of a hydraulic-feed drill that uses a twist drill on stationary work and that drills amazingly straight oil holes in connecting rods. The secret seems to be in a feed that advances the drill a trifle more than its diameter and then withdraws it to clear the work and the chips. It repeats this clear through the work and "nurses" a hard spot until it is passed so as not to throw the drill out. There may be something new under the sun after all.

What Shall We Call These Threads

German engineers have, I understand, three thread classifications that designate the uses to which the threaded piece is to be put. Bolts and capscrews that hold two or more parts together and generally "stay put" are in one class. Then there are threads which work in a nut to move parts of a mechanism like a lead screw, a cross-feed screw or even the prosaic lifting jack. Last, and fortunately but seldom used, is the threaded joint that must be tight enough to prevent steam, water, oil, gas or other fluid from leaking around the thread.

The first thread can be almost anything that will hold. It can be a partial thread if of sufficient strength. Or it can be a jam or force thread. The second type of fit must be free enough to avoid undue friction and have surface enough to resist wear. A really tight thread, steam tight we used to call it, must make complete contact to prevent flow around top, bottom or sides. What shall we call these three fits? Just as a starter may I suggest *holding, working* and *pressure?*

Abrasives in Cylinder Walls

A reader who has had railroad experience cites the case of a locomotive slide valve that was lapped with emery and that wore out very quickly. He feels that the honing of automobile cylinder blocks is bad practice and that cheapness and the probability of selling replacement parts may influence the adoption of the method. He is probably half-right—the first half as to cost. But the phenomenal length of life of modern cylinder blocks and pistons discounts the second reason. If there was an appreciable amount of abrasive left in the walls by the hone, we would not find motors with 75,000 to 100,000 miles to their credit, without touching the cylinder bores or piston, as is frequently the case.

Gardens Help Out Goodrich Men

I've seen a number of panics or hard times; too many for comfort. But never before have I seen such genuine interest and concern on the part of management for the welfare of their men. I could tell tales of sacrifice on the part of management that are almost unbelievable—but that's another story—this has to do with farm gardens. Not a new idea of course, and not an answer to the problem, but one way of helping tide things over till we find a real remedy.

The B. F. Goodrich Co. rented 275 acres near Akron, got expert advice and assistance, and gave about 750 men a chance to put in 150,000 man hours over a period of 25 weeks. The work was done systematically as a single enterprise and the produce prorated according to the time worked. Men who worked one day a week received 22 bushels of potatoes and a great variety of other produce totaling more than a ton per man; averaging about $1.60 for a day's work at the market price. An interesting feature is that the best factory workers, in most cases, made the best garden workers. The plans for the present year anticipate that one day's work a week for 25 weeks will provide vegetable food for the family for 36 weeks.

Carving Models from Potatoes

One of my old friends who has always been a most versatile mechanic tells me of a way he has for making small sized models with neatness and dispatch. Where the size permits he has abandoned wood, plaster and the like, for the great food staple, the potato. The limit of size is the Idaho bakers, but the ordinary spud answers for many small models. Nor does he whittle the whole job with a knife, even if he is a Yankee. He uses the miter box and a fine-toothed saw to get his angles, and other tools when they save time. Holes are drilled with a twist drill spun in the finger but he warns that a quarter inch drill usually makes a five-sixteenth hole, so other potato-ites can select drills accordingly. Of course the potato shrinks as the water dries out. But the dried model keeps quite a while if mice and roaches are kept from sampling it. Needless to say there is no grain to contend with and models can be made quickly.

SHOP EQUIPMENT NEWS

Fay Automatic Double-End Milling and Centering Machine

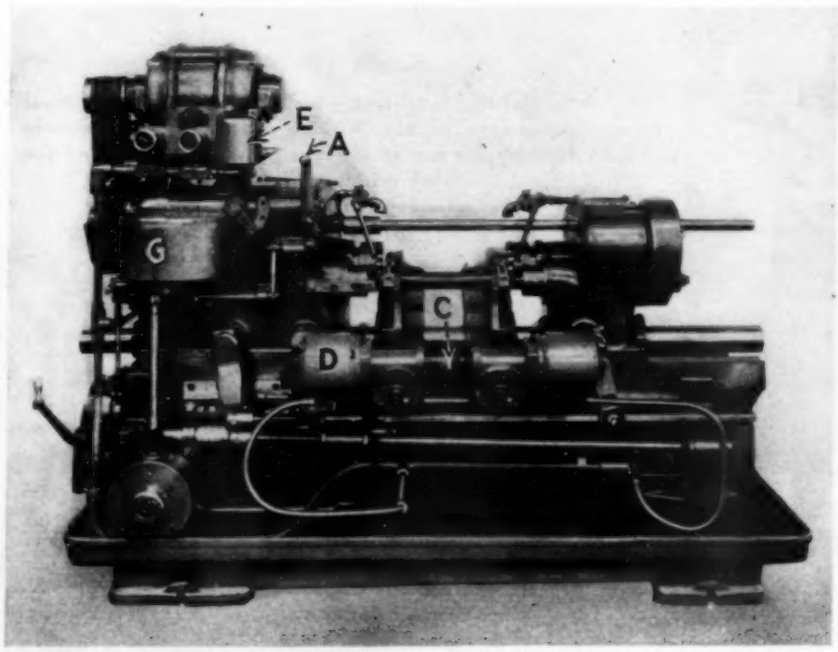
The Jones & Lamson Machine Co., Springfield, Vt., recently developed an automatic double-end milling and centering machine for milling to length and centering to uniform depth both ends of shafts, stem gears and similar pieces preparatory to the turning operations. The machine has a single pulley drive through a multiple-disk clutch mounted on the main drive pulley. It has a variable-speed headstock arranged for three speed changes by means of sliding gears. All gears and shafts are hardened, ground and mounted on ball bearings. The milling and centering spindles are also mounted on ball bearings.

The right-hand milling head is adjustable on the ways of the machine by means of a leadscrew at the back. Both work supports are adjustable so that they can be located to grip forgings or shafts in a convenient position. By loosening two clamp screws, these work supports can be moved longitudinally on the center-bar of the machine to suit various lengths of work.

All movements of the machine are controlled by hardened cams on the outside of the cam drums, and the work-holding units are supported on hardened and ground former block *C*. The work is clamped in hardened V-blocks by electric torque motors *D*, which are operated by a drum switch *E*. Nine feeds ranging from 3 to 22 in. per min. are provided. These feeds are obtained by means of pick-off gears located in the feed gear housing *G*. The fast motion of the machine is obtained through a multiple-disk clutch and drive shaft at the back. The standard V-blocks, cutters and cams are designed for round stock from ¾ to 3½ in. in diameter. Additional V-blocks, cams and cutters can be furnished to increase the capacity of the machine to work up to and including 4½ in.

Operation of the machine is as follows: The work is clamped in the V-blocks by the electric torque motors and the machine is started by the lever *A*. The work holding units move in fast motion up to the milling cutters and both ends of the shaft are milled simultaneously to the required length. The machine next goes into fast motion and moves the work to the centering position. Both ends are centered to uniform depth, after which the machine goes into fast motion and returns to the original position.

This double-end milling and centering machine is built in various bed lengths with maximum distances between the milling cutters of 20, 32, 44, 62 and 80 in. For short work, by removing the right-hand, work-holding fixture, the right-hand head can be moved up so that the length of the work that can be milled and centered depends only upon the width of the remaining V-block and holder.



Shafts and other parts can be milled to length and centered on the Fay Automatic Double-End Milling and Centering Machine preparatory to turning

"USS" Stabilized Stainless Steels

Announcement has been made by the Subsidiary Companies of the United States Steel Corp., Room 1602, 208 South La Salle St., Chicago, Ill., of the development of a method of stabilization of 18-8 (18 per cent chromium, 8 per cent nickel) stainless steels with titanium addition. This development removes the hazard of intergranular corrosion, a phenomenon which has been a serious factor in installations where heat-treatment is impracticable after welding and in cases where these steels are used in applications involving high temperatures. The process and methods of heat-treatment used in the production of "USS" stabilized 18-8 are covered by patent applications. The improved product is now available in all stainless steel products manufactured by subsidiary companies of the corporation.

"Nichrome V" Heat-Resisting Alloy

The Driver-Harris Co., Harrison, N. J., is now offering "Nichrome V," a nickel-chromium alloy which may be used as a heating element material in

the following electric furnaces: heat-treating, carburizing, annealing, cyaniding, nitriding, melting, enameling, patenting and bright annealing. The alloy is furnished in the form of wire, ribbon and rod. It was developed to have the properties of longer life, quicker heating and greater overload capacity.

Wichita Dual-Purpose Toolroom Grinder

A dual-purpose toolroom grinder has been placed on the market by the Wichita Machine Tool Co., Wichita, Kansas. The machine will perform either internal or external grinding as required on locomotive taper reamers, milling cutters, end mills, machinists hand taps, spiral expansion reamers, solid reamers (without decreasing size), valve reseaters, boring bars, taper boiler reamers, line shaft reamers and do general toolroom grinding. The operating principle is unusual in that the grinding head is universal in every direction and that the head is brought to the work rather than the work being brought to the head. The index finger used in surface grinding is made an intergral part of the grinding head. With the grinding head set at zero, the finger is at center in relation to the work held between the headstock and tailstock. The degree of relief desired is obtained by setting the grinding head off center by a corresponding number of degrees.

Fluted-type reamers are ground in the flute to prevent decreasing the original size of the tool. The distance between centers is 17 in. An extension tailstock is provided to increase this distance to 48 in. Maximum diameter handled is 9 in. A special live headstock is furnished as optional equipment for use in internal grinding of dies and for the grinding of large valves.

Swift Air-Operated Spot Welder

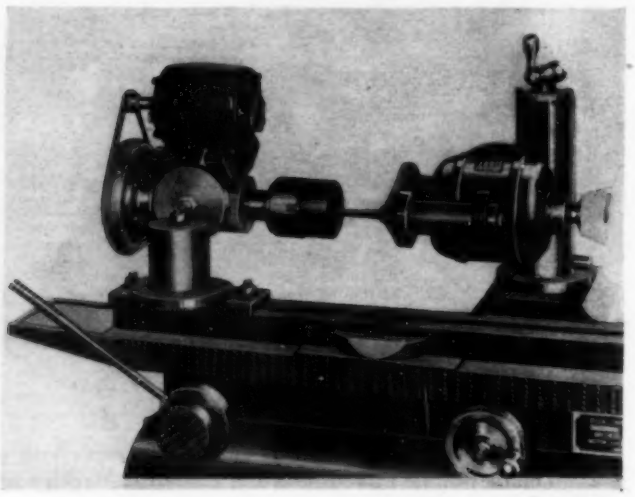
The Swift Electric Welder Co., Blvd. Temple Bldg., West Grand Blvd. at 12th St., Detroit, Mich., has brought out an air-operated automatic spot welding machine for production work on steel, stainless steel, aluminum, brass and copper. The transformer capacities are 25 to 40 kva., wound to operate on 220, 440 or 550 volts, a.c., single-phase. There are six points of heat regulation for welding up to a combined thickness of ¼ in. in steel.

A small main air cylinder operating through a toggle delivers pressure to the work. The upper head of the machine has a graduated handwheel for vertical adjustment, permitting quick set up. In the air control mechanism

Capacity of this Swift Spot Welder is a combined thickness of ¼ in. in steel

Wichita Dual-Purpose Toolroom Grinder which has a universal grinding head. Relief is obtained by setting the grinding head off center a corresponding number of degrees

Special live headstock which is furnished as optional equipment on the Wichita Dual-Purpose Toolroom Grinder for use in internal grinding of dies and for the grinding of large valves



a shaft, on which is mounted adjustable cams for controlling the current and air valves, is driven by a ⅛-hp. synchronous motor through a reducer and change speed gears. These change gears provide up to 180 reciprocations of the ram per minute. An interlock switch prevents repeating even though the operator fails to take his foot from the pedal. The anti-repeat interlock may be disconnected, however, for rapid repeat welding. The split-cam, current-control switch is composed of two cams having a series of drilled holes, the relationship of which may be changed to obtain 40 different values in the amount of "current-on" time for making a weld. An adjustment is provided for cutting the current off at the zero point of the cycle to avoid burning the contact points.

French Hydraulic Plastic Molding Presses

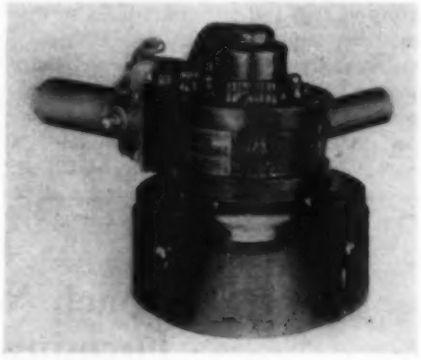
Two hydraulic presses built by the French Oil Mill Machinery Co., Piqua, Ohio, for molding parts from synthetic plastics are illustrated. Fig. 1 shows a press with an auxiliary tilting head to which the top die is attached. This head is supported by short arms centered on the rear columns and by long arms centered on top of and toward the front of the press cylinder. Each arm has a cam slot in which operates a roller fastened to the side of the ram platen. As the platen moves upward into the pressing position, the rollers pull the long arms forward, causing the tilting head to move through an arc of 90 deg. The head comes to rest in a horizontal plane directly against the stationary press head. This motion is accomplished without the use of auxiliary cylinders.

Full pressure is thus taken against the main head of the press, no part of the tilting mechanism being required to carry any of the pressing load. When the operation is completed, the ram recedes and the head that carries the top die automatically tilts back into the position shown. An advantage of this type of press is that the die members can always be inspected with ease, thus promoting cleanliness and the molding of accurate parts.

The semi-automatic molding press, shown in Fig. 2, is usually furnished with grids on which the molds are mounted. As this press returns to the open position, a lower knock-out is operated to eject the parts from the molds. The ejecting mechanism is released by pulling the lever at the front of the press, which causes the molds to open for reloading. The return motion of the platen also operates a top knock-out for ejecting parts from the top die.

"Rotor" Surface Grinder and Disk Sander

The Rotor Air Tool Co., 5704 Carnegie Ave., Cleveland, Ohio, has developed a portable tool in several models for various uses, each with a fixed speed best suited for the purpose. For grinding the 5,500 r.p.m. model is recommended. This model employs a 6x1½ in. straight-side cup wheel for flat surfaces. On welds a 6¼x2 in. flaring cup wheel is employed as it enables the operator to watch the removal of excess metal and to grind it down flush with the



adjoining metal. A 3,600 r.p.m. model is used with a cup-shape wire brush for removing rust and scale. For fine finish on metal surfaces the 4,700 r.p.m. model is offered, equipped with a 9-in. flexible sanding pad and abrasive disks.

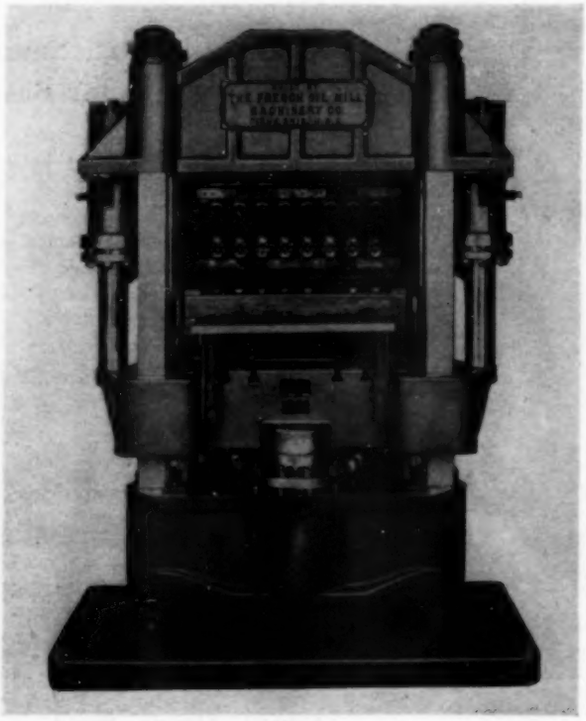


Fig. 1—French No. 1003 Hydraulic Plastic Molding Press having an auxiliary tilting head to which the top die is attached

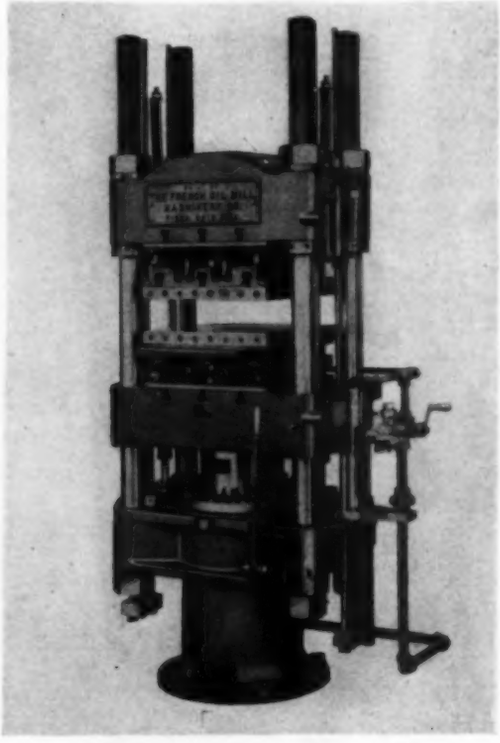
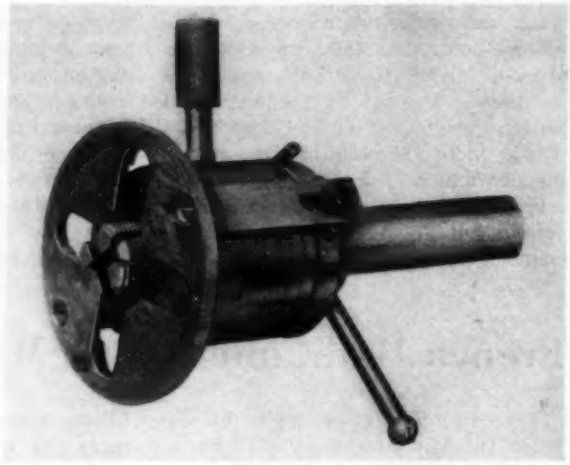


Fig. 2—French No. 1288 Hydraulic Plastic Molding Press of the semi-automatic type

Geometric Class PS Collapsing Tap

A sensitive-tripping tap, known as Class PS, has been developed by the Geometric Tool Co., New Haven, Conn. This collapsing tap has been developed for two purposes: (1) To handle a wide range of work on shallow depth tapping; that is, short thread lengths; and, (2) to handle work where it is necessary to clear obstructions or projections at the bottom of the hole. The first class of work covers such items as shallow-depth caps, thin wall tubing or any shallow depth, fine pitch tapping job where a precision trip tap is required. The tap may be tripped either by the conventional trip plate or by a lever. Both means of tripping are furnished with the tool. To use the tap as a lever trip tool, a stop can be rigged up on the cross-slide to contact the long handle at the rear of the body. The trip plate can be removed if the lever trip is used.

The Class PS tap is built in three sizes covering a range from $1\frac{3}{8}$ in. up to 6 in. The 3-in. size handles from $1\frac{3}{8}$ to 3 in., the 4-in. size from 2 to 4 in., and 6-in. size from 3 to 6 in.

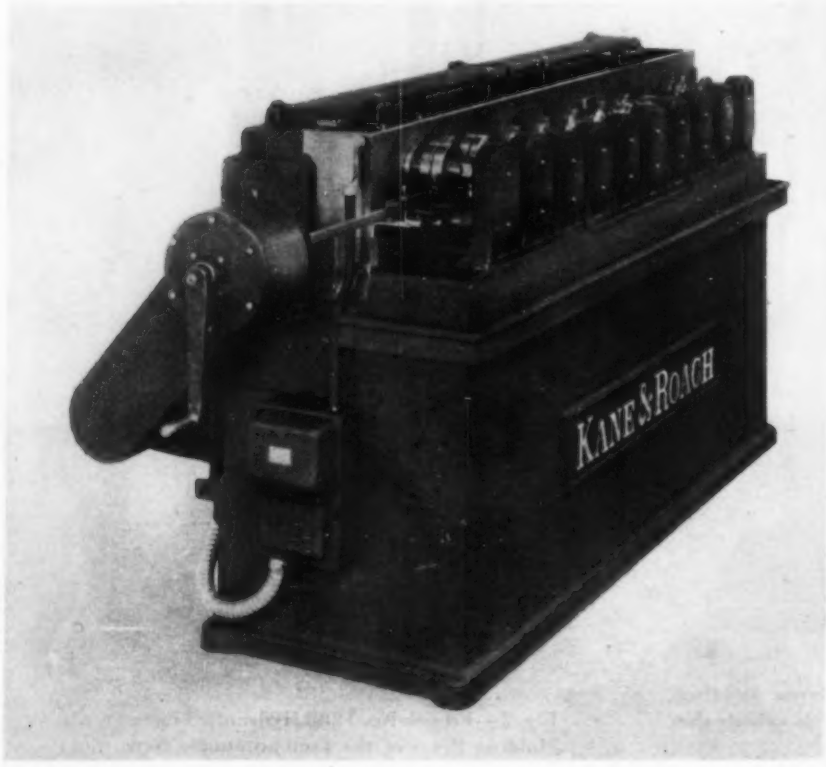


Shallow depth tapping or clearing obstructions at the bottom of the hole are the two fields of use for the Geometric Class PS Stationary Collapsing Tap

Kane & Roach No. OOX Cold Roll Forming Machine

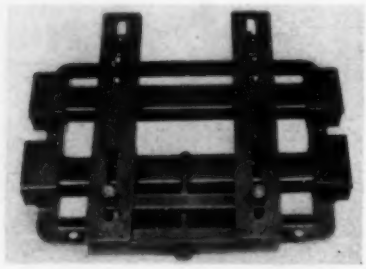
An outboard-housing type of cold-roll forming machine designed for high speed operation has been placed on the market by Kane & Roach, Inc., Syracuse, N. Y. Production is 270 ft. of formed strip per minute. Drive from the motor is by means of V-belts to a line shaft, to which is coupled a series of worm-reduction units, each one of which drives a number of roll stands. Worm drives, couplings and spur gears operate in an oil bath, and all bottom-roll shaft bearings and intermediate shaft bearings are automatically lubricated. The few remaining bearings have high-pressure Alemite fittings.

The motor is mounted on the rear side of the cabinet base. An improved sub-base permits motor adjustment for taking up slack in the V-belts. A section was formed on this unit from lake copper, tin-coated and was rolled into automobile radiator tubes at a production of 270 ft. per minute. This type of machine can also be designed for taking the stock from the coil, cutting the stock and feeding it into the forming machine at the same rate of production. The machines are suitable for rolling a wide variety of shapes and sections and can be furnished with a varying number of roll stands and in various sizes.



General Electric Sound-Isolating Motor Base

Floating members of the sound isolating motor base, developed by General Electric Co., Schenectady, N. Y., are suspended on specially developed isolating material which is enclosed and mounted to prevent damage. The motor itself is mounted on a standard sliding base. Belt tension and motor alignment are maintained in the ordinary manner. The stiffness of the sound isolating ma-



General Electric Sound-Isolating Base for motors employed for belt drive. Isolating material is enclosed in the boxes

terial is sufficient to maintain motor alignment for any reasonable belt tension. The base is designed for use of each particular motor for which it is recommended. It is effective at any motor speed between 100 and 66 per cent of normal speed.

Bases are available for the following motor ratings and speeds: Polyphase induction motors of 1 to 50 hp., 900 r.p.m.; ¾ to 30 hp. 1,200 r.p.m.; 1 to 3 hp., 1,800 r.p.m.; and single-phase motors of ½ to 2 hp., 900 r.p.m.; ½ to 2 hp., 1,200 r.p.m.; 1 to 5 hp., 1,800 r.p.m.

Producto No. 12½ Automatic Cam Milling Machine

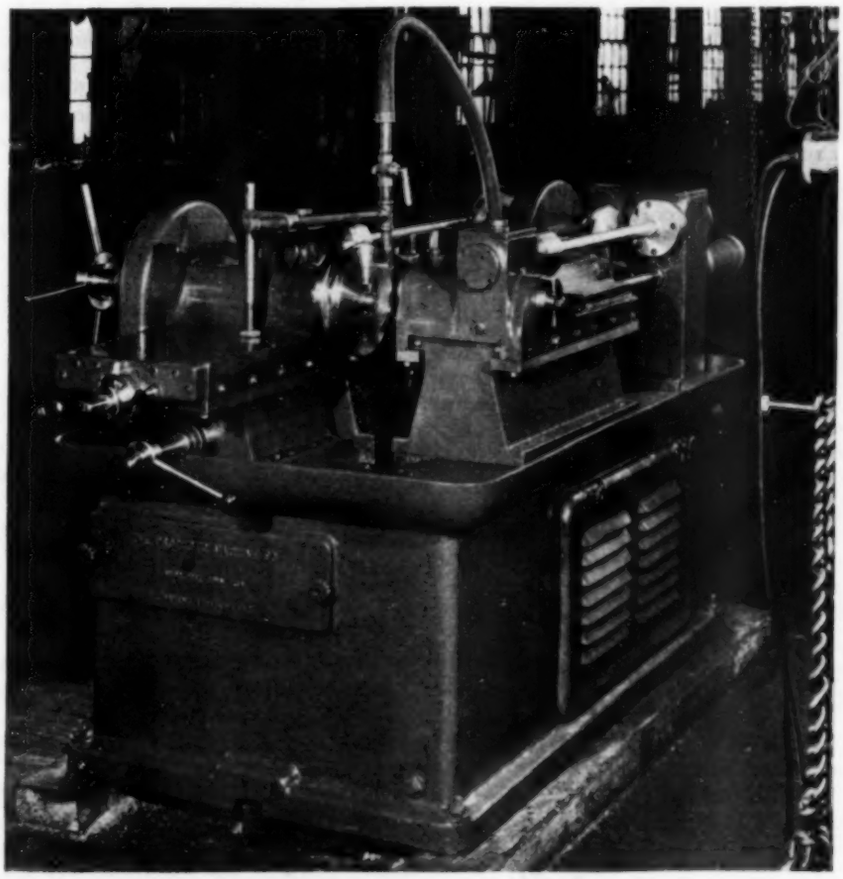
Two paths, surfaces or contours can be milled on the same piece simultaneously on the No. 12½ automatic cam miller announced by The Producto Machine Co., Bridgeport, Conn. Separate master cams are used to control the action of the two cutter slides so that different forms or contours can be produced on each of the paths if desired. A separate attachment can be provided to produce the master cam from the sample or model of the work itself, thus permitting the use of the machine on a wide variety of work. It is said that the machine is made heavy enough so that considerable metal can be removed and still permit a smooth finish.

The illustration shows the cam miller set up for a timing or valve lift cam used on radial airplane engines. This cam is about 10 in. in diameter by ⅝ in. wide and has two paths to be milled—one for the intake and one for the exhaust, each path being ¼ in. wide. The surface is milled from a rough forging, and a smooth finish is produced ready for hardening and finishing by grinding. This cam has four lobes in each path and one piece is completed in 7½ to 8 min.

Each cutter spindle is driven by a worm and worm gear that derives its power from the main gearbox. At the rear of each cutter spindle slide is a roll and bracket mounted in contact with the master cam. Constant pressure between the roll and the master cam is maintained by two compression springs, the compression being adjusted by means of screws. The short camshaft is also driven by a worm and worm gear and secures its power from the main gearbox through a clutch. Pick-off gears are provided to control the actual feed required.

The work spindle is also driven by a worm and worm gear, the speed of which can be changed by means of pick-off gears. Work spindle is 25 in. long by 3⅛ in. diameter with a 1½ in. hole throughout for a draw bolt.

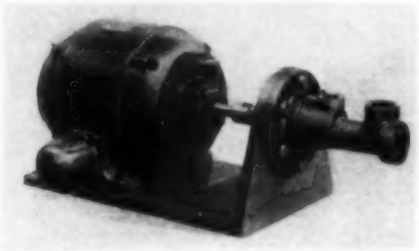
The machine is fully automatic and during a complete cycle of the work spindle the complete surface of any cam or part is produced. Work is clamped by a handwheel as shown or by means of air chucks. Depending on the size of work and the amount of metal being removed, the machine requires a 5 to 7½ hp. motor.



Two paths on a 10-in. valve lift cam for a radial airplane engine are machined in 7½ to 8 min. on this Producto No. 12½ Automatic Cam Milling Machine

DeLaval Motor-Driven Rotary Displacement Pump

The DeLaval Steam Turbine Co., Trenton, N. J., is offering motor-driven and turbine-driven rotary displacement pumps for supplying oil at constant pressure to burners so that the oil will be atomized uniformly at all times. The



pump employed is the "IMO" type (*AM*—Vol. 76, p. 1210). The small electric motor driven pump illustrated is designed to supply 2½ gal. per min. of bunker C oil at 100 deg. F. against a pressure of 100 lb. per sq.in. It is driven by a ½-hp. motor running at 3,450 r.p.m. The unit, exclusive of the motor, weighs 15 lb. Other units are built to provide comparatively large output.

Abbott Copper Lining for Ball Burnishing Barrels

A self-locking copper lining has been developed by The Abbott Ball Co., Hartford, Conn., to be used as a lining for ball burnishing barrels. It is said that the design of the lining sets

up additional movement in the barrel to afford quicker finishing and that it also acts as a burnishing medium. Maintenance costs are also said to be lower.

Magnetic Brakes for Janette Motorized Speed Reducers

Motorized speed reducers manufactured by the Janette Mfg. Co., 556 W. Monroe St., Chicago, Ill., can now be furnished with magnetic brakes where rapid stopping is required. The brake is of the solenoid type and is mounted on the front end-frame of the motor. A steel case incloses the mechanism. Besides making the company's speed reducer applicable to machines that require instantaneous stopping upon the completion of a piece of work, the brake also permits the use of repulsion-induction motors with machines that require quick-reversing.

Emerson 3-Hp. Motors

The Emerson Electric Mfg. Co., St. Louis, Mo., has added a line of 3-hp. motors which operate at 1725 r.p.m., and which can be furnished in single-phase, repulsion start induction, and polyphase squirrel-cage types besides a d.c. compound wound type. Shafts are of tool

steel and bearings are of bronze, wool packed. Oil reservoirs are oversize. Motor frames have ventilating openings, and a fan is mounted on the armature shaft. The motors are built to the NEMA dimensions and the mounting dimensions of the several types are identical. Special types can be furnished.

Ramet Tantalum-Carbide Tools for All Metals

The Ramet Corp., a subsidiary of the Fansteel Products Co., North Chicago, Ill., has announced the development of a complete line of Ramet tantalum-carbide tools for cutting, drawing and working all metals. In addition to cutting applications, wire, tubing and extrusion dies have been developed from special grades of Ramet. Grades manufactured are as follows:

Grade A: For general service in machining cast-iron and non-ferrous materials in which there is edge wear and only a slight tendency toward cratering. This service includes such materials as aluminum and aluminum alloys, brass and bronze, cast iron, malleable iron and semi-steel having a steel content of not more than 20 per cent.

Grade AA: Similar to Grade A, but especially designed for intermittent cuts and other heavy-duty applications that involve rough handling and shock.

Grade C: For cutting materials which require a combination of resistance to cratering and to edge wear such as cast alloys used in crankshafts, having a hardness of 300 Brinell or more, cast steel having a hardness of 300 to 400 Brinell, steels heat-treated to a hardness of above 300 Brinell, and steel screw stock with high sulphur and phosphorus content (SAE 1112 and 1120).

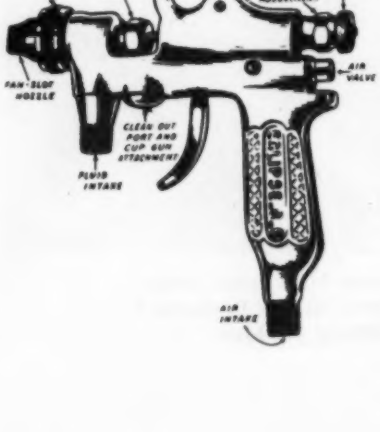
Grade C: For soft steels which have the greatest tendency to cause cratering, which in general include steels below 250 Brinell.

Grade D: Similiar to Grade C but for harder steels and high speed operation. These include the range from 225 to 300 Brinell. It is also adapted for light, fast cuts on steels below 250 Brinell.

Grade X: High resistance to both cratering and edge wear for very hard steel (above 450 Brinell) and for manganese steels having 12 to 14 per cent manganese content.

Eclipse Type G-6 Spray Gun

The Eclipse Air Brush Co., Inc., 77 Orange St., Newark, N. J., has produced a Type G-6 spray gun having a variable trigger tension adjustment to be regulated to suit the operator. Regulation of the flow of the sprayed material is accomplished by a knurled-nut adjustment located at the "hammer position" on the gun. Width of spray may be varied. The air brush operates at low pressures and incorporates a fan-slot, internal-mixing nozzle.



• TRADE • PUBLICATIONS

DIE CUTTING & MOLD CUTTING MACHINES. Pratt & Whitney Co., Hartford, Conn., Keller Division, has recently issued two circulars as follows: "The Keller Automatic Die Cutting Machine, Type E" and "Keller Automatic Bottle Mold Cutting Machine". Both circulars give complete descriptions of the operation and construction of these machines. Typical jobs are well illustrated.

EMPLOYEE HANDBOOKS. Compiled by the Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y., is a report "Employee Handbooks," which states that such booklets have been found of distinct value in improving and preserving relations with personnel.

FEED FOR PUNCH PRESSES. The U. S. Tool Co., Inc., Ampere, N. J., has issued a leaflet on the tool slide feed for punch presses. The feed is built for the automatic feeding of flat and round stock in coils to punch press dies and derives motion from the press eccentric.

JIG BORING MACHINE. Catalog No. 560, available from the R. Y. Ferner Co., 1133 Investment Bldg., Washington, D. C., describes the Model MP-2C jig boring machine made by the Societe Genevoise Instruments de Physique, Geneva, Switzerland, and illustrates the features adapting the machine for drilling and boring and laying out of holes up to 1½ in.

VARIABLE SPEED REDUCER. The Smith Power Transmission Co., Penton Bldg., Cleveland, Ohio, issued a circular on the "Johnson Variable Reducer" (*AM*—Vol. 77, p. 258), giving more complete information on the construction and operation of this variable speed reducer.

WELDING AND CUTTING COSTS. A publication "How to Figure Oxwelding and Cutting Costs", 8 pages, 8½ x 11, published by The Linde Air Products Co., 30 E. 42nd St., New York, N. Y., is of value to managers and supervisors who wish to set up methods of figuring welding and cutting costs. Three different methods for computing the material consumption, and the conditions under which each should be used, are presented in tabular form.